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SEX HORMONE FACTORS IN RECURRENT ABORTION AND STERILITY

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THE causes which have been ascribed for spontaneous abortion are legion. While it is possible that all of these causes have applied to individual cases, none of them has been fundamental. Especially is this true in so-called habitual abortion, a better term for which is recurrent abortion. The purpose of this paper is to call attention to certain demonstrable pathologic factors which link sterility or diminished fertility in some cases, and recurrent abortions, as parts of the same fundamental abnormality, and to present a small series of cases which have been successfully treated on this basis. Those cases of sterility in the female which are due to more or less gross anatomic defects, such as tubal closure, for example, are not within the scope of this discussion. Cases of diminished male fertility, of the type to which Moench and I have called attention, probably fall within it.

When the cases mentioned above are excluded, those of sterility or diminished fertility which remain, and spontaneous abortions, particularly those of the recurrent type, must be due to abnormalities of the seed or the soil, or both, i.e., the ovum, the spermatozoon and/or the endometrium. It is my opinion that the endometrium, except in the rare case, but reflects the endocrine factors which produce the histologic changes in it. The endometrium is singularly resistant to inflammatory or infectious processes, and those which may at times inflict it are

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largely acute and transient. I believe that such conditions are seldom, if ever, the causative factor in recurrent abortions.

In considering defective germ plasm, Streeter says, "It must be understood that defective germ plasm is described on the basis of behavior rather than microscopic appearance. **** If the building materials are good, then the egg is good. In such cases endocrine influences should not be powerful enough to disturb normal development." Regarding the last sentence, the work of many investigators proves that such is not the case in experimental animals, and it seems unreasonable to believe that the human being is an exception. The many reported successes of treatment on endocrine bases in such cases seem to indicate that endocrine factors *are* powerful enough to disturb normal development of the human fertilized egg.

Mall states that of human abortion ova dating from the first month, he found only a fifth normal. There is no reason to disbelieve that defects do occur in the germ cells which are inherent in them, and which give rise to faulty products of conception which of themselves die and are aborted. There may be other abnormalities of the germ cells and later the embryo, of chemicobiologic nature, which are not demonstrable microscopically, but which may be sufficient to prevent continued development. In such cases, endocrine factors probably play a paramount rôle.

In the female there is a structure which mirrors accurately the hormone factors which are responsible for its cyclic histologic appearance, viz., the endometrium. Especially can the story of these factors be read in the immediate premenstrual endometrium. Varying types and degrees of sex hormone imbalance in the female are reflected in varying types and degrees of departure from normal of this structure. The hormones which are responsible for the type of endometrium present are elaborated by the same organ, and more particularly the same structure in it, viz., the follicle and resultant corpus luteum, which produces the ovum. These in turn are dependent upon certain sex hormones of the anterior hypophysis.

Normal conception and pregnancy are dependent upon the union of two normal germ cells, and a normal soil for the development of the fertilized ovum, i.e., a normal endometrium. It is possible to discern microscopically from the examination of the premenstrual endometrium even minor grades of departure of this structure from normal. Since such abnormalities found here represent sex hormone deficiencies or imbalances in the individual, it seems reasonable to suppose that disorders of fertility in these cases may be due either to the fact that such hormonal imbalance simultaneously produces abnormal ova, or, the fertilized ovum being so intimately dependent upon this endometrial soil for its development, that these defects in the endometrium *may* be

responsible for the defects which may or may not be microscopically demonstrable in the aborted embryo or fetus. Also both factors may be operative together. The same may be true for the entire failure of conception in some of the cases.

In the male, there is no structure such as the endometrium in the female which so well reflects sex hormone states. However, evidence seems to indicate that an abnormally high percentage of grossly abnormal sperms in a semen specimen is an index of lowered fertility in that individual, resulting in failure of impregnation or an increased incidence of abortions. I have previously stated that it is my opinion that factors inherent in the male germ cells themselves are responsible for the abnormal specimen as a whole. In other words, the endocrine factors which are responsible for the abnormally high percentage of grossly abnormal forms also operate to diminish the fertility of those sperms which do appear normal microscopically. Otherwise it is difficult to understand why, even in such specimens, fertility is diminished, when the apparently normal sperms outnumber the grossly abnormal ones many thousands to one.

It is in order to review briefly the hormone factors responsible for the endometrial changes which take place during the menstrual cycle. Immediately following menstruation, the endometrium has been desquamated until only the basal layer remains on the uterine musculature. The glands are straight, widely spaced and compact, being lined by a single layer of low columnar or cuboidal cells with central nuclei. By this time, a primordial follicle in the ovary has begun to develop. During the period of its development estrin is elaborated, under whose influence a hyperplasia of the endometrium occurs, marked by an increase in thickness, an increased vascularity, and by a hypertrophy and hyperplasia of the uterine glands. Somewhere about midinterval the follicle ruptures, the ovum is extruded, and the ruptured follicle is converted into the corpus luteum. The elaboration of estrin is continued by this body, but the characteristic hormone of the corpus luteum is progesterone. The hyperplasia of the glands therefore continues, but under the action of progesterone certain premenstrual changes occur in the hyperplastic glands. These take on a definite secretory appearance, marked microscopically by columnar epithelium with basal nuclei, vacuolization of the cells, distention of the lumina by secretion, and a distinct "fuzziness" of the inner gland borders. Figs. 1 and 2 show well these normal premenstrual characteristics.

The development of the Graafian follicle and subsequent corpus luteum is dependent upon the sex hormone or hormones of the anterior hypophysis. While not yet proved, the mechanism is somewhat easier to understand if we follow the postulation of two such hormones, the follicle stimulating hormone and the luteinizing hormone. The first is respon-

sible for the development and maturity of the Graafian follicle, and probably both, but particularly the latter, for the development of the corpus luteum.

A normal premenstrual endometrium, therefore, presupposes a normal ovarian cycle, with a normal elaboration of, and balance between, estrin and progesterone. This in turn presupposes a normal activity of the

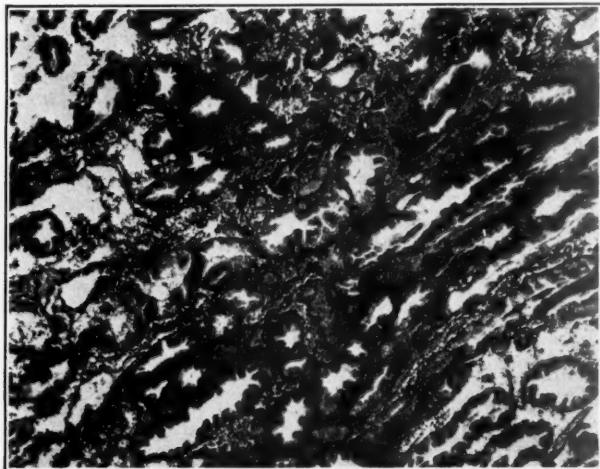


Fig. 1.—Normal endometrium.

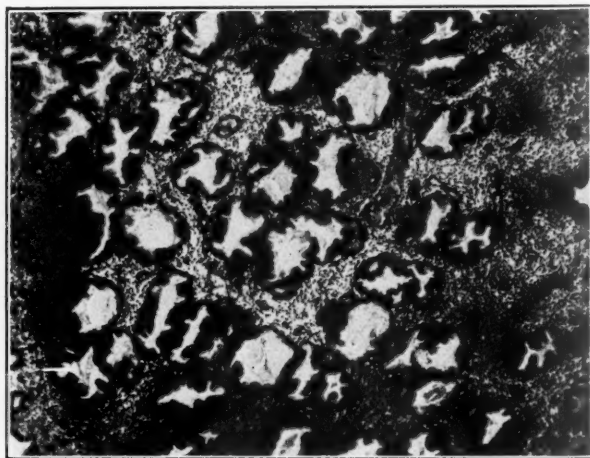


Fig. 2.—Normal endometrium.

sex hormones of the anterior hypophysis. Since studies have increasingly shown the close interrelationship between all the endocrine glands, and the effects produced upon the rest by abnormalities in one, it follows that the presence of such a normal endometrium is probably evidence of a normal balance between all the endocrine glands, at least so far as the female sex-cycle is concerned.

In another paper, photomicrographs of premenstrual endometriums are shown which grade almost imperceptibly from the normals described above and illustrated, to the typical "Swiss cheese" pattern, which is the one most familiar to the pathologist. Curettages are not usually done for the clinical conditions which accompany or result from those endometriums of considerably less pathology, which are here under discussion. However, it is these types which are of importance from the standpoint of recurrent abortions and other disturbances of fertility.

It is of much interest that these departures from normal all seem to begin with evidences of diminishing progesterone influence on the uterine glands, as marked by their lessened secretory appearance immediately before menstruation. In other words, the corpus luteum seems to be at fault. In a succession of endometriums of increasing pathology, signs of corpus luteum activity diminish until there is no evidence of it at all, in which case we infer that ovulation has not occurred. In these marked cases, all menstrual rhythm is frequently lost, bleeding is continuous, and the endometrium assumes the "Swiss cheese" appearance, associated with polycystic ovaries, in which there is no evidence of current corpus luteum activity.

It is known that the corpus luteum is necessary for the continuance of early pregnancy, possibly through the second month or a little longer, but that its removal after a certain time in the human is not necessarily followed by abortion. Evidence has accumulated to show that the placenta also has an endocrine function similar to, and possibly identical with, the corpus luteum, since the same hormones are obtainable from it. As the pregnancy progresses, and beginning with the development of the placenta, the activity of the corpus luteum wanes, and its function in the continuation of the pregnancy is evidently taken over by the placenta.

It is significant that in cases of recurrent abortion, most of them occur between the second and third month. This is also true of the occasional abortion. It is at about this time that the corpus luteum ceases to be necessary for the continuation of the pregnancy, its hormone function being assumed in full probably by the placenta, as noted above. Is it not possible that abortions at this time are due to the fact that the corpus luteum activity ceases too soon, or that the ascension of the placental elaboration of hormone is too slow, so that there is a period of time when progesterone sinks below a level necessary for the continued development of the embryo, and abortion results? This may be due fundamentally to an insufficiently fertile decidua, or to direct injury to the embryo, or both. In those cases where examination of the premenstrual endometrium shows already evidence of corpus luteum deficiency, the damage resulting in abortion at this usual time may be

gradual in its effect, and cumulative, in the decidua and/or in the embryo and its nutritive processes, i.e., the trophoblast or developing placenta.

The same reasoning applies to those cases in which conception does not occur, and in which examination of the premenstrual endometrium shows evidence of progesterone deficiency. Both of these conditions may therefore be considered parts of the same fundamental condition, viz., a deficient corpus luteum function by which insufficient progesterone is elaborated. In lesser degree it may permit the nidation of a fertilized ovum but be unable to meet the demands of continued development. In greater degree the endometrium is so poorly prepared that nidation itself is impossible. As stated previously, the assumption that the endocrine factors responsible for this condition may already have produced an ovum (or analogous factors in the male the spermatozoa) potentially below par seems not unreasonable.

In the cases described below, each premenstrual endometrium, except one, which it was possible to obtain, shows evidence of corpus luteum (progesterone) deficiency. From the results of therapy in those cases in which an endometrium specimen was not obtained, the conclusion that such a deficiency was present seems justified.

In the past, commercial preparations of progesterone of proved potency have not been available, and in the treatment of these cases pregnancy urine extracts have been used. While observation has not shown such results in the human ovary as occurs in the ovaries of experimental animals following injection of pregnancy urine extracts, it is possible that an action considerably short of this might stimulate the corpus luteum to adequate activity.

Mazer and Goldstein call attention to the fact that even in cases of recurrent abortion, the anterior pituitary-like hormone is always present in large amount in the urine and for this reason do not believe that such therapy is indicated in these cases. I infer from their text that their reference is to the hormone as obtained from the pituitary itself. They also point out that pituitary implants and injections of pituitary extracts produce superovulation and seem to cause or favor abortion instead of preventing it. This is in line with the observations of the D'Amours and others that extracts obtained from the pituitary are predominantly follicle stimulating, while those obtained from pregnancy urine and placenta are predominantly luteinizing. While the urine of an individual case might contain sufficient luteinizing hormone to give a characteristic reaction in the ovaries of the mouse or rat, it might still be insufficient for that individual's pregnancy, which insufficiency could be supplied by the luteinizing hormone present in greater amounts from

the urines of other pregnancies. While most abortions, particularly of the recurrent type, occur early, abortion at any time during a pregnancy may occur from an imbalance of estrin and progesterone, which may not have been present from the beginning of the pregnancy or before.

The following cases are presented:

CASE 1.—I. M., aged twenty-six years, first seen Dec. 19, 1929. First pregnancy occurred shortly after marriage in 1926 and was normal throughout. Last menstrual period was Oct. 23, 1929. Spontaneous abortion occurred Dec. 25, 1929. Next pregnancy dated from menstrual period of Dec. 29, 1930. In spite of the usual treatment of sedation and bed rest, abortion occurred March 11, 1931. After this abortion, complete sterility study was made. All results were negative except for evidence in the premenstrual endometrium of progesterone deficiency (Fig. 3). Basal metabolism rate was plus 4 per cent.



Fig. 3.—Case 1.

While the glands in this specimen are hyperplastic, and show considerable infolding, both glands and stroma are rather compact, and are lacking in that "succulent" appearance of the normal premenstrual endometrium. The glands are definitely deficient in secretory appearance.

The next pregnancy dated from the menstrual period of Aug. 23, 1932. On October 27, slight bleeding occurred; no cramps. All other abortions had begun in this manner. On this date, 2 c.c. of pregnancy urine extract were given, and bleeding stopped within six hours. This amount was repeated on alternate days for two weeks, when it was discontinued. On December 6, there was again slight bleeding, which stopped within three hours after the injection of 2 c.c. of the extract. After this, 2 c.c. of the extract were given weekly until March 1, 1933, when the injections were discontinued. She was delivered in April, about one month prematurely, of an otherwise normal baby girl which lived and developed normally.

The next pregnancy dated from the menstrual period of Sept. 18, 1934. Thinking that perhaps the glandular system had been improved by the former pregnancy, no treatment was given during this pregnancy. The membranes, probably defective, ruptured at five and one-half months, followed by abortion. There have been no

further pregnancies to the present time (March, 1937). Evidence in this case points to a hormone abnormality which is gradually increasing in severity.

CASE 2.—D. B., aged nineteen years, first seen Oct. 24, 1932, had been married for two and one-half years. First pregnancy occurred within ten months after marriage. There was a spontaneous abortion of this pregnancy at two and one-half months. She was referred for consultation because another pregnancy had not occurred. Complete sterility study was done and both husband and wife were considered normal. However, conception did not occur again until following the menstrual period of Sept. 28, 1934. No treatment was given, and abortion occurred Nov. 21, 1934. After bleeding and cramping had started, morphine, bed rest, and pregnancy urine extract were used without effect upon the course of the abortion. After this abortion, the case was restudied, including the premenstrual endometrium. Again it was considered normal (Fig. 4). It is the only premenstrual endometrium yet examined in a patient who has had as many as two successive spontaneous abortions, which has been considered normal.



Fig. 4.—Case 2.

The next probable pregnancy dated from the menstrual period of June 15, 1936. She was examined July 30, and diagnosis of probable pregnancy made. She presumably aborted August 10, while away on a vacation.

The next pregnancy dates from the menstrual period of Oct. 5, 1936. Treatment consisting of 2 c.c. of pregnancy urine extract was begun within two weeks after the missed menstrual period, and was given twice weekly until Feb. 2, 1937, since which time it has been used once a week. The pregnancy has been uneventful except for severe intermittent uterine cramps which began suddenly on Dec. 9, 1936, and which stopped entirely, not to recur, within an hour after the injection of an additional 2 c.c. of the extract.*

CASE 3.—F. M., aged thirty-two years, was first seen in 1933 because of severe menorrhagia. This patient's premenstrual endometrium is shown in Fig. 5. It is obviously deficient in progesterone influence. Physical examination was negative

*This patient was treated as outlined in the text until one month before term, and was delivered at term, July 14, 1937, of a normal child.

except for marked endocarditis. Administration of pregnancy urine extracts was always effective in controlling the excessive menstrual bleeding, frequently stopping it within three or four hours.

She had two children, six and two years of age. She stated that she flowed regularly at what would have been menstrual periods for three months during the first pregnancy, and for five months during the second. The first baby was born one month prematurely, the second at term.

Her last pregnancy dated from the menstrual period of May 15, 1935. There was a scanty flow in June and July. While recognizing the hormone imbalance in this case, no treatment was given, as the heart condition made an interruption of the pregnancy not inadvisable. She did abort spontaneously Aug. 1, 1935, at about two and one-half months.

CASE 4.—V. W., aged twenty-seven years, was first seen March 2, 1936. This woman had been married for two and one-half years. There had been spontaneous abortions in June, 1934, and in July, 1935, both between the second and third months.

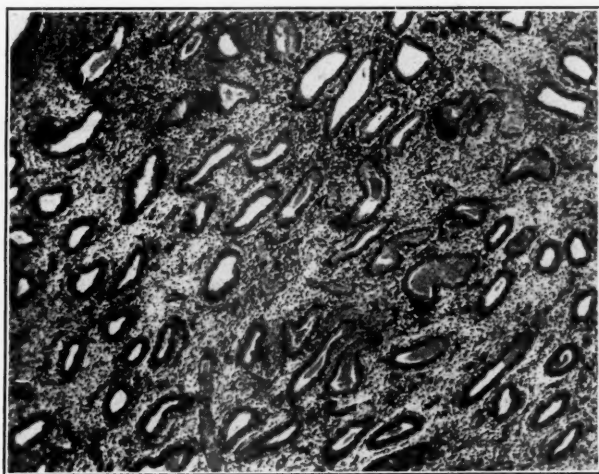


Fig. 5.—Case 3.

Last pregnancy dated from the menstrual period of Jan. 22, 1936. The case was studied as well as could be, since she was already pregnant when first seen. All results were negative except a basal metabolism rate of minus 11 per cent. She was placed on $\frac{1}{4}$ gr. of thyroid twice daily, which was subsequently increased to $\frac{1}{2}$ gr. Pregnancy urine extract, 2 c.c. twice a week, was given until after the fourth missed menstrual period, when it was reduced to once a week, and it was continued in this dosage until the patient went spontaneously into labor.

It is interesting that this patient delivered about three weeks past term. The baby showed evidence of intrauterine loss of weight, marked chiefly by flabbiness and laxness of the abdomen, and the placenta was markedly fibrous and calcified. The entire pregnancy was normal and uneventful, and the subsequent development of the baby was normal.

CASE 5.—B. W., aged thirty-one years, was first seen in 1932. This patient had been married for five years. No contraceptives had ever been used, but conception had not occurred. Menstrual history was essentially negative, except that there was occasional dysmenorrhea, and flow tended to be scanty.

Sterility study was made in this case, which was negative, except for the abnormal premenstrual endometrium, which is sufficient to explain both the scanty menstruation and the sterility. Not only is the progesterone activity markedly deficient, but the endometrium is generally hypoplastic (Fig. 6).

For various reasons, this patient was not treated, and the case is included because of the type of endometrium found.

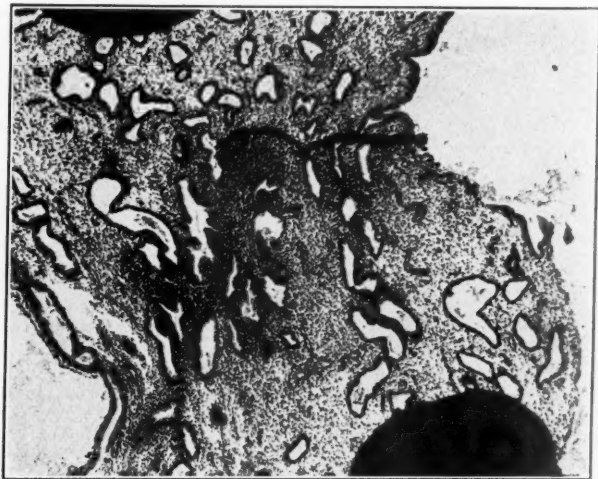


Fig. 6.—Case 5.

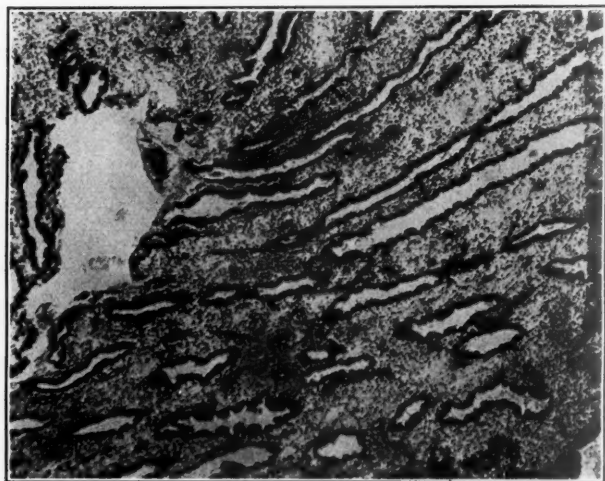


Fig. 7.—Case 6.

CASE 6.—M. R., aged thirty years. Her first pregnancy occurred in 1931, two years after marriage, following rather promptly the discontinuance of contraceptives. This pregnancy was complicated by an attack of pyelitis, but continued to term. Delivery was without incident.

Contraceptives were resumed following this pregnancy, and were used until June, 1935. The next pregnancy dated from the menstrual period of November,

1935, and spontaneous abortion occurred the latter part of December. (Both the pregnancy and abortion here are assumed, as neither was verified.)

Following this, complete sterility study was done. All results were negative except for the appearance of the premenstrual endometrium (Fig. 7). While the appearance of the glands is proof of a functioning corpus luteum, its influence on the glands is obviously subnormal.

Pregnancy had not occurred following this episode. Menstruation occurred Oct. 4, 1936. Pregnancy urine extract, 1 c.c., was given three times a week during the two weeks preceding the next expected period. It began October 30. The same procedure was followed during the two weeks preceding the next expected period in November. This did not occur, and pregnancy test was made three weeks later and found strongly positive. Pregnancy was subsequently diagnosed clinically.

The patient continued to receive 1 c.c. of the extract twice a week. During this time she was working from ten to sixteen hours daily in chemical research, in addition



Fig. 8.—Case 7.

to which during the Christmas holidays she was quite active socially. She contracted influenza on December 29, which was epidemic in Denver at the time, and was quite ill, with high temperature. She aborted Jan. 3, 1937. It does not seem that this pregnancy had a reasonable chance, although I feel that more frequent and larger doses of the extract might have prevented the abortion, since this one occurred at the usual time, viz., between the second and third month. This patient is the only failure to date, in the type of case under discussion, when treatment could be started as soon as the pregnancy was diagnosed.*

CASE 7.—B. S., aged twenty-seven years, was first seen in January, 1935, shortly after her marriage. At this time patient stated that her menstrual periods were normal. However, she also stated that seven years previously, the right ovary had been removed at the time of an appendectomy because it was "cystic."

*This patient is again pregnant, dating from Oct. 5, 1937. Again conception did not occur until after treatment during the last half of a menstrual cycle with pregnancy urine extract. Since the first missed menstrual period, she has received proluton in diminishing doses from 1 unit three times a week to 1 unit once a week. She is now five months pregnant. The present therapy will be continued to shortly before term. To date there has been no threatened interruption of the pregnancy.

Patient next seen in September, 1935, at which time she was complaining of dysmenorrhea, which she had not had previous to her marriage. This was relieved by dilatation of the cervix. Pelvic examination was entirely negative except for the absence of the right ovary.

Next seen in July, 1936, because pregnancy had not occurred since discontinuance of contraceptives in October, 1935. Complete sterility study was made, with negative results, except for the appearance of the premenstrual endometrium (Fig. 8). Here also the appearance of the glands denotes a deficient corpus luteum activity. The resemblance of this specimen to that shown in Fig. 7 is rather marked.

No treatment was given at the time, but conception not having occurred by February, 1937, treatment as outlined in the preceding case was instituted. She has menstruated once since it was begun.

This case is included before the results of treatment are known for the purpose of illustrating the type of endometrium found.

An examination of the premenstrual endometrium forms an indispensable part of every investigation to determine the cause of failure of conception or of recurrent abortions. As has been stated elsewhere by myself and others, a curettage of sufficient thoroughness to secure ample tissue for microscopic examination is a simple office procedure, practically without risk, and devoid of the need for anesthesia. In no other way can these relatively minor hormone deficiencies be determined, without which rational therapy is impossible.

It is interesting that in one of the cases cited (I. M.) treatment with pregnancy urine extract was discontinued two months before term, and this pregnancy ended prematurely at eight months. In another (V. W.), it was continued until labor began spontaneously, and this patient went over term three weeks. The placenta had a marked "senile" appearance, and the baby, as stated, showed evidence of intrauterine loss of weight, presumably because of diminished nutrition through the fibrous and calcified placenta.

Many adverse reports have appeared in the literature regarding the treatment of threatened abortion with the anterior pituitary-like hormone. It should be repeated that it has been shown that such hormones obtained from the pituitary itself, are predominantly follicle stimulating, while those obtained from pregnancy urines, and probably those from placentae, are predominantly luteinizing. Both types of preparations, of course, contain both hormone fractions.

Another point to emphasize is, that if demonstrable hormone deficiency is present even before the pregnancy begins, this effect on the nidatory soil, and probably on the developing embryo and its nutritive processes, is probably continuous and cumulative to the time of the abortion. *It is evident, therefore, that a threatened abortion may represent, not the beginning of trouble, but the end of a damaging process which is past help.* If this view of the matter is taken, one does not wonder that treatment instituted at the time an abortion is threatened is so frequently fruitless.

Treatment along hormone lines, and any other indicated, as for example thyroid in cases of hypothyroidism, and at all times an adequate

calcium and vitamin intake, should be begun as soon as pregnancy is suspected, in all patients with any past history of reproductive difficulty. Also adequate preparations in these cases should probably be given more frequently and in larger doses than have heretofore been done.

There are good reasons for believing that progesterone itself might serve better in these cases than the attempt to stimulate the ovary or more particularly the corpus luteum to the elaboration of increased amounts of its own hormone by the use of pregnancy urine extracts. However, as is well known, no such preparations of progesterone of proved potency have been available in commercial quantities. It may be that they are now on the market, but if so, they have still to be proved clinically.

THE MEDICAL ASPECTS OF VARIATIONS IN FERTILITY*

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(From the Milbank Memorial Fund)

THE medical profession has long been concerned with individual problems of fertility and sterility, but the larger problems of broad variations in fertility in population groups have been studied mainly by sociologists and students of population problems. They have found that birth rates are low among the white-collar and professional classes and high among laborers, and that urban birth rates are considerably lower than rural birth rates.^{1, 2} The urban groups are not producing enough children to reproduce themselves and replacements for our future population are coming mainly from rural groups. Students of the problem are questioning whether migration into the cities is selecting the best of these stocks, leaving the groups with least cultural or genetic endowment as a future population reservoir. Recent researches^{3, 4} have shown that the differentials in the birth rate may be due to differences in the prevalence and effectiveness of contraception in the various social classes, rather than to inherent biologic differences in fertility. There may be, in addition, a differential prevalence of sterility, but we have no information concerning the prevalence of sterility in specified population groups. The problems of sterility and of voluntary control of fertility are of special interest to obstetricians and gynecologists, and for this reason the broader problems of variations in fertility become of immediate medical concern.

The causes of variations in fertility may be classified into two groups: (a) involuntary causes—those which are due to differences in physiologic activity or intercurrent pathology and which happen without reference to any effort on the part of individual couples to control their fertility, and (b) voluntary causes—those which are the direct result

*Adapted from a paper read before the joint meeting of the American Statistical Association and the Population Association of America, Chicago, Illinois, December 30, 1936.

of conscious efforts to control fertility. In the strictest sense, voluntary control of fertility is of sociologic rather than of medical concern, but so far as voluntary control affects the public health, it also becomes a medical problem. Both groups of factors may be present at the same time, but for convenience they will be discussed separately.

Present knowledge concerning the involuntary causes of variations in fertility relates to those factors which lessen fertility or produce sterility. They may be classified as (1) those which interfere with the possibility of the fertilization of an ovum, and (2) those which interfere with the wife's ability to bear a live child. It is, of course, well known that absolute sterility is a rare phenomenon. Meaker found that only 30 per cent of the patients coming to him for the medical treatment of sterility could be classified as absolutely sterile. Fertility is not an all-or-none proposition.

Reynolds and Macomber,⁵ in experiments with rats, found that the fertility of a mating was the product of the fertility of the individual partners; and Meaker,⁶ in discussing the problem of human fertility, expresses the situation as follows: "The human animal . . . is by comparison with others a poor breeder, rarely endowed with . . . absolute fertility. . . . Most couples who succeed in reproducing do so in spite of certain imperfections in the conceptive mechanism; . . . in other words, most people are relatively and not absolutely fertile."

The importance of any one cause of sterility or infertility is unknown. Sterility, which is the only aspect of the problem which has been studied to any extent, is seldom caused by a single factor. Usually there are several underlying causes, and conception does not take place until most or all of these difficulties have been eliminated. Most pathologic conditions are temporary and reversible with treatment. Thus, a couple may be infertile for a period and then become fertile, or vice versa. The incidence of involuntary sterility or infertility in broad population groups at any one time is unknown.

In a recent study by the Milbank Memorial Fund staff of the preclinic control of fertility by a group of women who subsequently attended a birth control clinic in New York City,^{7, 8} a small amount of information was available concerning the incidence of gross pathology in the group.*

*The Milbank Memorial Fund was requested by Mrs. Margaret Sanger to make a study of a group of patients of the Birth Control Clinical Research Bureau in New York City. The group selected for study comprised all the women who first came to the clinic from the Borough of the Bronx in 1931 and the first half of 1932 and were still living in the Bronx in 1933 and 1934, when the study was made. The records were obtained by the author in personal interviews with the women in their homes. Each record contains a complete fertility history which includes the dates of marriage and the date and type of termination of each pregnancy, as well as the history of associated pathology and information concerning contraceptive practices before each pregnancy. All data here published relate to the fertility of these women before attendance at a birth control clinic. The types of contraception practiced were those in general use in the population at large.

The following are examples of the cases excluded because of the history of pathology which probably interfered with fertility:

- (1) Unilateral oophorectomy (Case 823).
- (2) Marked retroversion; tubes inflated and cervix cauterized before conception took place (Case 990).
- (3) Pelvic abscess following self-induced abortion (Case 522).
- (4) Husband impotent because of severe endocrinopathy; conception followed endocrine therapy (Case 608).

It was found that when the total exposure and pregnancies of 57 patients with known serious pathology were excluded from the tabulations, pregnancy rates, when contraception was not practiced, showed no decline with length of married life after the first pregnancy.* A sharp decline following the first pregnancy is probably due to the presence of periods of lactation and amenorrhea which may precede all pregnancies except the first. The rates are compared in Fig. 1 and Table I. The

TABLE I. PREGNANCY RATES PER 100 PERSON-YEARS' EXPOSURE WITH AND WITHOUT THE TOTAL EXPOSURE AND PREGNANCIES OF 57 PATHOLOGICAL CASES*

PERIOD OF MARRIED LIFE	RATES FOR PERIOD DURING WHICH CONTRACEPTION WAS NOT PRACTICED		RATES FOR PERIOD DURING WHICH CONTRACEPTION WAS PRACTICED	
	ALL WOMEN	PATHOLOGIC CASES EXCLUDED	ALL WOMEN	PATHOLOGIC CASES EXCLUDED
First pregnancy	271	304	41	42
Second and succeeding pregnancies				
Total	105	125	27	28
0-4	114	125	32	33
5-9	102	125	27	27
10-14	81	117	24	26
15-29	69	131	15	16

*From an analysis of the preclinic fertility of 991 women who subsequently attended a birth control clinic. Records on which this analysis was based were collected by the author.

same women could and, for the most part, did have exposure with and without contraception. Three findings are indicated from comparing the rates with and without the experience of these 57 women: (1) that the inclusion of the pathologic cases definitely lowered the rates among women who did not practice contraception, (2) that the influence of pathology on these pregnancy rates increased with age (length of married life), and (3) that the use of contraceptives had so marked an effect in itself in lowering pregnancy rates that the absence or presence of pathology in the proportion in which it appeared in the exposure during which contraception was practiced did not affect pregnancy rates significantly. These tabulations relate to a small and highly selected group of women, but they suggest the possible influence of pathology on pregnancy rates.

*The pregnancy rates represent pregnancies per 100 person-years' exposure to risk of pregnancy. A woman is presumed to be exposed to the risk of pregnancy when she is between menarche and menopause, living with her husband, and not pregnant. We have, therefore, deducted from the total months of each woman's married life (1) all separations of husband and wife, (2) the actual number of months of gestation for each pregnancy plus a month or a fraction of a month for the puerperal period following it, and (3) the period following menopause or sterilization. The time remaining is the total exposure to risk of pregnancy, and pregnancy rates have been computed by the following formula:

Rate = $\frac{P}{Y} \times 100$, where P = number of pregnancies, and Y = number of years of exposure to risk of pregnancy. The rates represent the total experience of all women in the specified duration of married life and type of exposure, before attendance at a birth control clinic.

The types of contraception reported were mainly condom, coitus interruptus, douche, and alternations of these methods. The rates for the exposure during which contraception was practiced refer to the combined exposure with all types of contraception. Detailed studies of the relative effectiveness of these types of contraception have been previously published.^{7,8}

The influence of pregnancy wastage on birth rates has been difficult to determine accurately. In the study previously cited and in two additional studies from the Milbank Memorial Fund, the fertility records included the date and type of termination of every pregnancy. The women showed little or no reticence in discussing past abortions when they knew the confidential nature of the individual records. Information concerning abortions appears, therefore, to be unusually reliable, and its reliability is confirmed by the consistency of the data under all types of analysis. It was found that the average incidence of accidental pregnancy wastage (stillbirth, spontaneous abortion, etc.) was between 10 and 12 per cent of all pregnancies, and was not significantly different in several economic groups or in three religious groups, nor did it change with increasing length of marriage or order of pregnancy. There was also no indication that its prevalence had changed within the periods

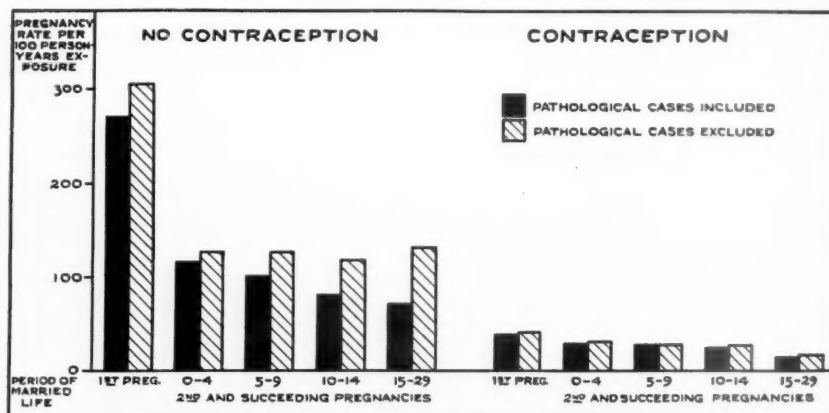


Fig. 1.—Pregnancy rates for periods during which contraception was and was not practiced for a group of 991 women including 57 pathologic cases, and for the same group exclusive of the pathologic cases. (From an analysis of the preclinic fertility of women who subsequently attended a birth control clinic. Records on which this analysis was based were collected by the author.)

studied. Although the samples studied are small, the evidence is suggestive that this type of pregnancy wastage is probably unimportant in producing variations in fertility.^{9, 14, 21} Additional evidence from other studies confirms this finding (Table II). The proportion of pregnancies terminated by involuntary wastage is strikingly similar in all groups for which detailed information is available.

There is additional indirect evidence which makes it appear probable that involuntary factors are of little importance in causing variations in fertility. The incidence of dietary deficiencies, infection, and other diseases which may cause infertility probably varies inversely with economic status. However, infertility as expressed both in childlessness and in total number of children born varies directly with economic status. A high birth rate is found in precisely those groups in which

TABLE II. OUTCOME OF PREGNANCIES FROM HISTORIES OF WOMEN IN VARIOUS AREAS OF THE UNITED STATES

SOURCE OF DATA	YEAR OF STUDY	NUMBER OF PREGNANCIES	PER CENT OF TOTAL BY TYPE OF TERMINATION				
			TOTAL	LIVE BIRTHS	STILL-BIRTHS	ABORTIONS	
						TOTAL	SPONTANEOUS*
Pregnancies previous to one reported on survey: New York City ¹⁴	1935-1936	1,525	100.0	85.4	2.6	12.1	9.2
Previous pregnancies and current hospital births: Chicago (white multiparae) ¹⁶	1931-1932	5,840	100.0	86.7	13.3†		2.1
New York City (white multiparae) ¹⁶	1931-1932	7,686	100.0	85.0	15.0†		3.2
Pregnancy histories of patients seeking contraceptive advice: New York City ⁹	1932-1933	3,106	100.0	69.4	1.3	29.3	22.1
Cincinnati**	1935-1937	7,289	100.0	81.0	2.2	16.8	8.0
Baltimore ^{17, 18}	1927-1932	6,441	100.0	84.4		15.6	10.1
Minneapolis ¹⁹	1931-1935	8,875	100.0	82.5	1.3	16.2	5.5
Newark ²⁰	1928-1930	8,314	99.9	77.4	1.2	21.3	11.6
Philadelphia†	1925-1936	1,221	99.9	82.8	1.2	15.9	5.2§

*Includes therapeutic abortions, except as indicated.

**Unpublished data from studies of the Milbank Memorial Fund.

†Unpublished data from the private practice of Dr. Lovett Dewees, analyzed by Gilbert Beebe. Personal communication.

‡The proportion of abortions among the current hospital births is almost certainly much lower than among pregnancies in the general population, since the hospitalized abortions will be chiefly those accompanied by a definite morbidity and therapeutic abortions. It may be estimated that the wastage among previous pregnancies of these women would be about 18 per cent for the New York women and 16 per cent for the Chicago group.

§Includes therapeutic abortions and 1.1 per cent unspecified abortion.

the types of pathology which might lead to infertility are most prevalent. It has been shown that in the small group studied the presence of pathology reduced the pregnancy rates of women who practiced no contraception. Therefore, to the extent to which couples practice no contraception, involuntary factors probably do reduce fertility and are at least partially responsible for the reduction in fertility with advancing age. Conversely, it is possible that relatively infertile couples find no need to practice contraception. The whole problem is exceedingly complex and can be summarized more easily after we have considered the importance of voluntary control as a cause of variations in fertility.

Voluntary control of fertility expresses itself in three ways: (1) in the practice of contraception, (2) in resort to induced abortion, and (3) in variations in frequency of coitus. Recent researches under the auspices of the Milbank Memorial Fund have shown the importance of voluntary control of fertility in producing variations in the birth rate. Professor Raymond Pearl, in his study of 30,000 women who came to hospitals to bear children, found no significant differences in age specific pregnancy rates by social class or color among women who had never practiced contraception. In his second progress report on part of his data,³ he showed that the prevalence and effectiveness of contraception were directly correlated with economic status in the group studied, and that the differences in pregnancy rates in that group were the result of these variations in contraceptive practice. Pearl estimates on the basis of his findings that 50 to 60 per cent of white married couples in cities east of the Mississippi and north of the southernmost tier of states practice contraception more or less regularly.

Contraception reduced pregnancy rates in Pearl's group by about 20 to 30 per cent,⁴ even when inexpertly and intermittently practiced. In the New York study previously cited,⁵ it was found that all contraception as practiced before contact with a birth control clinic reduced the risk of pregnancy by about 75 per cent. Both of these figures relate to pregnancies in a given period of exposure to the risk of pregnancy. A more realistic method of expressing the effectiveness of contraception as practiced by the New York sample is to compare the total pregnancy rate for the first ten years of married life, which includes time pregnant as well as time exposed, for women who did and did not practice contraception from marriage. All pregnancies, including those planned, are included in the rate of the group which practiced contraception. The pregnancy rates were just twice as high for women practicing no contraception as for those who practiced contraception from marriage (Table III). In other words, women who practiced no contraception had about twice as many pregnancies in the same period of time as did women who practiced contraception.

Illegally induced abortion appears to be of some importance in reducing the birth rate. It is impossible to estimate the prevalence of illegal

abortion in this country, since, being a criminal offense, it is not reported. Taussig¹⁰ estimates one abortion to 2.5 births in urban areas and one abortion to 5 births in rural areas. Recent studies indicate that the estimates for urban areas are probably high, since they are based on the preclinic records of women who attended the same New York birth control clinic for which data are included in Table II. Their induced abortion rates appear to be abnormally high when compared with those of groups unselected with respect to an interest in controlling their fertility, or with those of patients of birth control clinics in other urban areas (Table II). Estimates based on material from all sources indicate

TABLE III. PREGNANCY RATES PER TEN YEARS OF MARRIED LIFE FOR WOMEN MARRIED 0-9 YEARS*

ORDER OF PREGNANCY	NO CONTRACEPTION PRACTICED			CONTRACEPTION PRACTICED†		
	YR. MAR.	NO. PREG.	RATE	YR. MAR.	NO. PREG.	RATE
Total	452.3	307	6.8	2218.9	747	3.4
First pregnancy	121.3	106	8.7	620.0	320	5.2
Second and succeeding pregnancies	331.0	201	6.1	1598.9	427	2.7

*From an analysis of the preclinic fertility of 991 women who subsequently attended a birth control clinic (pathologic cases included). Records on which this analysis was based were collected by the author.

†Includes interruption of contraceptive practice for planned pregnancies.

that a total rate of 18 abortions (spontaneous and induced) per 100 live and stillbirths is probably a more accurate figure.¹⁵ Millar's studies in Cincinnati¹¹ show that the abortion index increased much more rapidly than the birth index, in the group studied, between 1918 and 1932. A study of the proportion of pregnancies terminated by illegal abortion in the New York group cited above showed that nearly one-fourth of all pregnancies were so terminated. The proportion of pregnancies terminated by illegal abortion increased directly with length of married life, and increasing order of pregnancy, and varied with income and religion.^{9, 21} The incidence of illegal abortion in this group is probably very much higher than in an average unselected population group, but resort to induced abortion appears to vary with order of pregnancy and social and economic status in other groups for which detailed information is available.^{12, 14, 21}

There are no reliable data on the relation of coital frequency to variations in fertility. This is probably partially due to the fact that couples do not know their average frequency of coitus. Reliable data have been obtained for a few couples from calendar records kept by those couples over a period of months or years. These have been made mainly in connection with isolated studies of sterility and of the so-called "safe period" and have not been correlated with fertility. In the New York clinic study previously cited, the women interviewed reported coital frequency immediately after marriage and at the time of the interview. Obviously, the reporting of coital frequency immediately after a mar-

riage which took place from one to twenty-five years before the interview is subject to wide error. However, it was assumed that this would be somewhat more accurate than the reporting of any other coital frequency except that at interview. A tabulation of the mean interval between marriage and the first conception by coital frequency, when no contraception was practiced, is shown in Table IV. There is a slight

TABLE IV. MEAN NUMBER OF MONTHS BETWEEN MARRIAGE AND FIRST CONCEPTION FOR WOMEN PRACTICING NO CONTRACEPTION, BY COITAL FREQUENCY IMMEDIATELY AFTER MARRIAGE*

COITAL FREQUENCY IMMEDIATELY AFTER MARRIAGE	NO. WOMEN	MEAN NO. MONTHS BEFORE CONCEPTION
Total	479	4.4
Once a week or less	45	4.6
Two to three times a week	212	4.7
Four to six times a week	121	4.3
Seven times a week or more	101	3.7

*From an analysis of the preclinic fertility of 991 women who subsequently attended a birth control clinic (pathologic cases included). Records on which this analysis was based were collected by the author.

but not significant shortening of the interval with increasing coital frequency. A study of post-clinic pregnancy rates by coital frequency at interview showed little or no relation between coital frequency and pregnancy rates since, although the information on coital frequency was probably relatively accurate, all the couples studied were practicing contraception of varying types and with varying degrees of effectiveness at that time. It appears that coital frequency has little or no effect on variations in fertility, but conclusive evidence on this point must await more accurate and extensive study.

All available data point to contraception and induced abortion as the most important causes of variations in fertility. Fig. 2, based on the same series of records, shows pregnancy rates for four successive periods of married life. The rates for each period are broken down to show the proportion of each type of pregnancy result. The pregnancy rates declined with increasing length of marriage, mainly because of the increasing practice and effectiveness of contraception in each successive period of married life. The birth rates declined even more rapidly than the pregnancy rates because of the increase in criminal abortion.¹³ Involuntary pregnancy wastage had little effect on the birth rate and did not vary with length of married life.

Research now in progress should give us new and valuable information on the physiology of reproduction. Until we know more about this subject, the interpretation of material concerning involuntary infertility will be difficult. Hartman's studies of ovulation in monkeys, showing, among other things, the frequency of anovulatory menstruation in these animals, impress us anew with our lack of knowledge concerning human ovulation. In the field of endocrinology, interesting work is being done in many sections of the country which is adding greatly to our knowl-

edge of the physiology and pathology of fertility. These researches have been largely confined to animal experimentation, but it is to be hoped that some of the techniques contrived will be applicable to human study before long.

Comparatively little is known concerning the physiology of reproduction, and even less is known about the effect of pathology in producing infertility. Information concerning the latter might be obtained by enlisting the support of a group of obstetricians and gynecologists who would be willing to keep simple, uniform fertility histories in connection with medical histories. Such a series of records might yield valuable information concerning the relative incidence of sterility or infertility in relation to certain pathologic processes. For example, in addition to knowing what percentage of sterility cases was due to tubal infec-

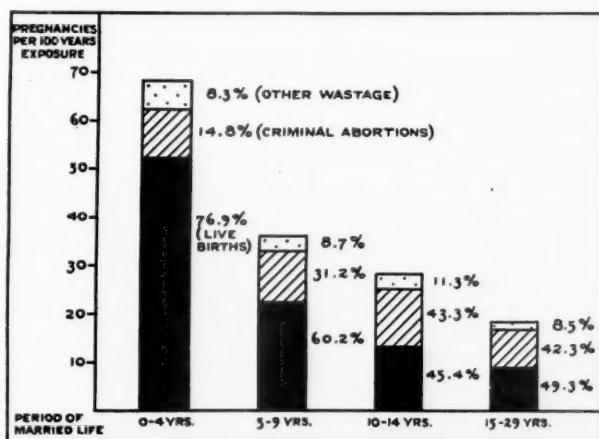


Fig. 2.—Pregnancy rates and distribution of pregnancy terminations by type in specified periods of married life. (From an analysis of the preclinic fertility of women who subsequently attended a birth control clinic. Records on which this analysis was based were collected by the author.)

tion, it would be possible to learn how frequently sterility or infertility is found in a known number of cases of tubal infection—a question which needs to be answered for all types of pathology. In addition to such a study, it is important that further studies of contraceptive practice and abortion be made in selected population groups of types different from those already studied.

A great deal of further research must be done before we know very much about the medical aspects of fertility. The study of the problem has been somewhat neglected by the medical profession until recently, but it is to be hoped that the recent awakening of interest on the part of a number of prominent physicians will furnish the impetus for further research in this field. Such researches are of vital importance to a positive attack on the problem of a falling birth rate.

SUMMARY

1. Recent scientific interest has been directed toward determining the causes of variations in the birth rates, since present differentials indicate that our future population will be recruited largely from agricultural and urban laboring classes.*

2. The incidence of involuntary sterility and infertility in selected population groups is unknown. Study of a small, selected group suggests that the increasing incidence of pathology with advancing age is an important factor in the decline in fertility, when contraception is not practiced.

3. The incidence of involuntary pregnancy wastage, in a selected group of women, shows no change with age or religion and has been approximately the same for the past twenty-five years.

4. Voluntary control of fertility by means of contraception and induced abortion is responsible for major variations in pregnancy and birth rates.

5. Further researches on the physiology of fertility and the incidence of sterility are needed before the causes of variations in fertility can be adequately interpreted.

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*The occupational groups on which these studies are based are a slightly modified form of the occupational code used by the United States Bureau of the Census in 1920.

THE VALUE OF HORMONAL FINDINGS IN HYDATIDIFORM MOLE AND CHORIONEPITHELIOMA

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CHORIONEPITHELIOMA relatively is so rare a disease, that in approximately forty years since it was first described,¹³ there have been reported probably not more than two thousand cases, while in the past seven years, since Aschheim¹ first recorded the significance of hormonal tests in relation thereto, not more than two- or threescore cases have been reported *in which hormonal tests have been correlated* to this type of tumor.

No reports so far (March, 1936) appear to embrace more than three cases of early chorionepithelioma *correlated* to hormonal test findings.

A report of the three cases encountered in the past three years in this hospital therefore would appear to require no apology.

In 1929 Fels and Rossler, as quoted by Mazer and Edeiken,¹¹ concluded:

1. That in hydatid mole and chorionepithelioma there is much more prolan secreted than in normal pregnancy.
2. The quantitative estimation of this hormone is an actual guide to diagnosis in that
3. Presence of increased hormone for more than *two weeks* after normal pregnancy, or more than *eight weeks* after the extrusion of hydatid, is *proof* of chorionepithelioma.
4. Persistence of positive test for this hormone *after* operation and removal of chorionepithelioma is *proof* of metastasis.

These conclusions appear to have obtained practically universal acceptance.

Brindeau and Hinglais² point out, while agreeing with other authorities, that the titer of prolan in hydatid and chorionepithelioma is very much higher than in normal pregnancy, by factors variously estimated at from ten to several hundred times, the actual titer in individual cases of either of these conditions varying within wide limits, but always above that of normal pregnancy. The prognostic importance of the behavior of hormonal tests therefore depends on relative curvature. They find that after the evacuation of a mole, for instance, whether the original titer has been from 2,000 to 60,000 rat units per liter, there is a prompt drop to less than a thousand. If, however, chorionepithelioma were present at the same time or developed subsequently to the hydatid, there will be a secondary rise within thirty to fifty days, which rise tends to be progressive. The occurrence of this secondary rise is adequate basis for a diagnosis of malignancy and for radical extirpation of the affected organ.

That the reverse of this positive significance of hormonal tests is *not* necessarily valid, is demonstrated by a case quoted by Schumann in a discussion of Kimbrough's paper,⁵ in which chorionepithelioma developed six months following a supposed miscarriage, although repeated hormonal tests in the interim had been negative.

Huberman, of Newark, recently reported a similar case to the Society of Surgeons of New Jersey.

We have delivered in this hospital up to the first of March, 1936, 20,450 living babies. We had 15 cases of hydatid mole, which is an incidence of one in 1,333 full-term deliveries. This is well within the widely divergent statistics of incidence from various sources. The incidence in terms of all pregnancies is impossible to estimate, because, although it is unquestionably much higher in relation to early abortions than it is to late pregnancies, our material here includes so few abortions as not to represent in any sense a cross-section of all pregnancies.

Schumann has long since pointed out the difficulty of arriving at any estimate of incidence referable to all pregnancies.

This does, we believe, represent the true incidence of material coming under our purview, inasmuch as every conception product, including abortion products, moles of all kinds and mature placentas, is subjected to careful gross and microscopic scrutiny in our laboratory.

Detailed analysis of this series shows the following data:

Age.—Youngest eighteen years, oldest 40 years, average 27 years. The majority were well in the fourth decade of life.

Race.—All except one occurred in white patients.

Parity.—In one-third of the patients the mole represented the first pregnancy; in the oldest individual in the group it was the ninth; for the majority it occurred in the third or fourth pregnancy.

Miscarriages.—Only two of the group had previous miscarriages and each of them had only one.

Subsequent Births.—Three of the group have had one later pregnancy and one has had two.

Symptoms Prior to Determination.—With two exceptions every case presented bleeding. The majority had cramps or other types of pain associated with the bleeding. Bleeding varied widely in duration and amount prior to coming under observation. Two presented vomiting, dehydration or other symptoms of toxemia. One had intercurrent valvular heart disease. One was characterized by apparent arrest of pregnancy. Only three showed enlargement of the uterus beyond that consistent with the estimated duration of pregnancy. One showed marked diminution in the size of the uterus as compared with that consistent with the estimated duration of pregnancy. One only had passed, and noted, characteristic grape-like masses before coming under observation.

Admission Diagnosis.—In only 3 was hydatid considered first as an admitting diagnosis; only 1 other hydatid was considered secondary as an admitting diagnosis.

The others were primarily diagnosed as: 2 placenta previa, 1 abruptio placentae, and 1 missed abortion. All the others as inevitable or incomplete abortions.

Nature of Products Passed.—The size and weight of the moles varied greatly. Phrases used to describe them were somewhat indeterminate, as "large hydatid";

"several pieces of hydatid tissue"; "500 c.c. of blood clot with hydatid tissue." Others were specified by definite weights: 80 gm.; 1,100 gm.; 2 ounces; 460 gm.; one uterus contained a well-formed six weeks' fetus, the placenta showing hydatidiform degeneration. Hydatid coexisted with missed abortion. One patient showed chorionepithelioma on curettage. One patient presented necrotic decidua, the hydatid characteristics of which were determined only by microscopic examination.

X-ray Findings.—In only four was the chest x-rayed prior to the termination of the condition, in all cases the result being negative for evidence of metastasis. Three patients showed no evidence of fetal parts by x-ray at a period of gestation when such parts should have been demonstrable by x-ray in normal pregnancy. The other patients had no x-ray examination.

Friedman Tests.—1. Friedman positive 11 and 29 days after passage of mole; no further Friedman observations but now reported in good health after three years.

2. Positive eight days after dilatation and curettage; negative fifteen days after; has had one normal pregnancy since and reported in good health.

3. Negative six and twenty-nine days after passage of mole; now reported in good health after four months.

4. Friedman negative and patient in good health at the present time, two years after passage of mole.

5. Positive before passage of mole and again twelve days later; negative seventeen and thirty-five days after passage of mole; now reported in good health more than two years later.

6. Negative seven days after passage of mole; positive thirty-four days after passage of mole and again negative thirty-seven days after passage of mole; reported in good health more than a year later.

This anomalous positive finding is not satisfactorily explained.

7. Positive in dilution up to 1-100 prior to hysterectomy; negative twenty-three days, again nineteen months postoperative; in good condition on physical examination at the present time.

8. No findings.

9. Questionable result eleven days after passage of mole; negative twenty-one days after passage of mole; positive three months after passage of mole; again positive three and one-half months after passage of mole. These positives were due to a succeeding pregnancy. This woman has had two living deliveries since the mole, the last March 25 of this year.

10. Negative eight days and thirty days after passage of mole; health good nine months later.

11. Positive five days and ten days after passage of mole; negative twelve days, nineteen days, and fifty-nine days after passage of mole. This patient is again pregnant, one and one-half years after passage of mole.

12. Positive four months prior to passage of a missed abortion; negative seven weeks later.

The other three cases were complicated by chorionepithelioma and will be separately discussed.

Operative Procedures.—Two patients expelled the mole completely without operative procedure; 1 was treated by abdominal hysterotomy for supposed abruption of the placenta; in 1 a supravaginal hysterectomy was done on a primary diagnosis of hydatid; in 3 others the conception product was removed by digital and forceps exploration of the uterus; and all the others were treated by dilatation and curettage.

Morbidity.—Ten of the 15 patients showed no morbidity whatever; 1 was febrile on admission but the fever stopped promptly with the passage of the mole, and the other 4 showed slight febrile reactions lasting from three to ten days.

Mortality.—There was no mortality in the entire group.

Postpartum Complications.—Two patients showed recurrent bleeding following the passage of the mole; 1 had severe secondary anemia and catarrhal jaundice; 1, severe anemia; 1, furunculosis of the back, and 1, vesicovaginal fistula following complete hysterectomy for chorionepithelioma.

Remarks.—All patients have been traced to the present time and are in good health now with the following exceptions: One is reported by a private physician to be in good general health but to have some type of undetermined ovarian pathology; 1 other has a slight ovarian enlargement; and 1 is now pregnant and in good condition.

Of the 15 cases of hydatidiform mole cited, 3 patients had chorionepithelioma. This is an incidence of 20 per cent of chorionepithelioma to all moles. As these are the only known cases of chorionepithelioma in our material, 100 per cent of our chorionepitheliomas have been preceded by moles.

Details of these three cases are as follows:

CASE 1.—(No. 13 of hydatid series.) (History No. 4181.) Patient, twenty-two-year-old white gravida iv. All prior history irrelevant except that almost two years before, an egg-sized freely movable mass had been noted in relation to the right vaginal fornix. Present pregnancy commenced Aug. 8, 1934. On Oct. 19, 1934, when two and a half months pregnant, had low abdominal pain, vaginal bleeding, and passage of a clot. She was admitted on the same date.

Because of continued bleeding and progressive anemia, dilatation and curettage was attempted Nov. 2, 1934; cervix was so rigid that this was not carried out, but a portion of tissue was digitally removed, which proved to be hydatid material. On Nov. 3, 1934, dilatation and curettage was accomplished with the removal of 700 gm. of hydatidiform tissue. She was given a transfusion of 500 c.c. of blood.

Friedman:

Positive 9th day after expulsion of mole to 5 c.c. of urine
Positive 23rd day
Positive 34th day
Positive 60th day

There had been 3 episodes of menstruation-like bleeding during the five weeks prior to her second admission, 54 days after removal of mole. Based entirely on the persistence of the hormonal reaction total hysterectomy was performed, sixty-eight days after removal of mole.

Examination showed a chorionepithelioma so completely imbedded in the myometrium that it would almost certainly have escaped detection by curettage.

Following hysterectomy:

Friedman—

Positive on 6th day
Negative on 9th day to 1 c.c. urine
Negative on 15th day to 5 c.c. urine
Negative 4½ months later
Negative 5 months later
Negative 15 months later (April, 1936)

Patient is now well, February, 1937, except that the right ovary is enlarged to about three times normal size, but this condition was apparently noted before the mole conception.

X-rays of chest for metastasis were negative April 1, 1936, and February, 1937.



Fig. 1.—Case 1. Chorionepithelioma of uterus, completely embedded in the musculature of fundus; does not reach the endometrium or the serosa; curette would not have revealed it.



Fig. 2.—Case 2. Hydatidiform mole preceding chorionepithelioma. Cysts are thin-walled and whole tumor shows extensive hemorrhagic degeneration and necrosis.

CASE 2.—(No. 14 of hydatid series.) Patient, a thirty-seven-year-old, white, grvida iv. (History No. 18448.) Prior history irrelevant except one miscarriage. Present pregnancy commenced in September, 1934. On Jan. 23, 1935, she began to

bleed; bleeding increased and on Jan. 29, 1935, she began to have severe pain in back radiating to lower abdomen. She was admitted Jan. 30, 1935, four and one-half months pregnant; no fetal heart heard. On Jan. 31, 1935, she passed spontaneously a 460 gm. mole. Nonmorbid puerperium.

Friedman:

Positive 4 days after extrusion of mole
Negative 12 days after extrusion of mole
Negative 18 days after extrusion of mole
Negative 21 days after extrusion of mole

Thirty-three days after extrusion of mole, she bled for four or five days with passage of small clots. Friedman test was twice positive within two and a half weeks of this episode. Because of the repeatedly positive Friedman after it had



Fig. 3.—Case 2. Uterus with polypoid hemorrhagic masses filling the uterine cavity. Large lutein cyst of ovary.

been negative for several weeks, total hysterectomy with bilateral salpingectomy and right oophorectomy was performed, March 21, 1935. A chorionepithelioma was found. The Friedman test was negative and her general condition was good March 28, 1936, more than twelve months later.

Acknowledgment is made of the privilege of reporting this case from the private service of Dr. Charles B. Kelley.

It is hoped that failure of metastasis to occur in these two cases, twenty-six and twenty-three months, respectively, after removal of tumors of a type notoriously rapid in metastatic development means definite cure.

CASE 3.—(Fifteenth in hydatid series.) (History No. 25435.) Patient, thirty-one-year-old white, gravida ii. Her previous history was irrelevant, except habitual menstrual irregularity. Present pregnancy commenced Aug. 22, 1935. On Dec. 15, 1935, passed painlessly a large blood clot, and on Dec. 21, 1935, passed another

clot which looked like grapes; Jan. 15, 1936, passed two cluster-like clots and one mass, size of an orange; admitted same date, slightly febrile, almost five months pregnant. On Jan. 16, 1936, 75 gm. of degenerated chorionic villi were removed by curettage; this and the orange size mass were found to be hydatid.

Friedman:

Positive 8th day

Positive 34th day

Positive 37th day

In the meantime there had been two episodes of bleeding, one of ten days' and one of two weeks' duration. Diagnostic curettage was done March 9, 1936, thirty-five days after extrusion of mole, and showed chorionepithelioma. X-ray at this time was negative for chest metastases. Complete hysterectomy was performed March 12, 1936, fifty-seven days after extrusion of mole. Pathologic examination

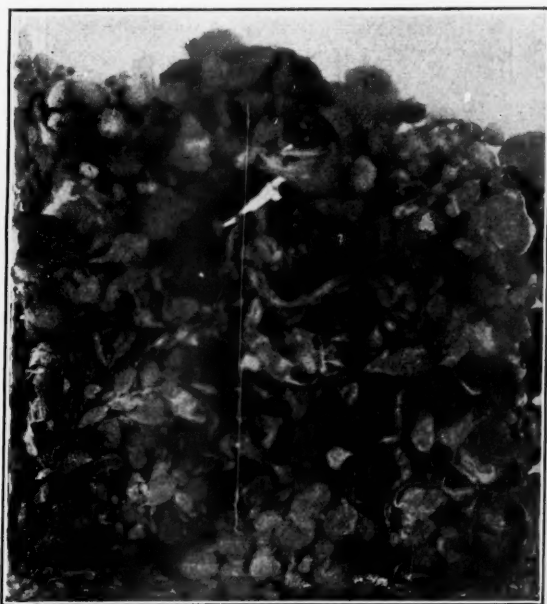


Fig. 4.—Case 3. Hydatidiform mole preceding chorionepithelioma. Cysts of irregular size, with extensive hemorrhage and necrosis.

of uterus confirmed presence of chorionepithelioma in fundus. Friedman: Negative March 26, 1936, April 11, 1936, and October, 1936.

This patient has been followed to the present, February, 1937, eleven months after hysterectomy and is completely well to date.

This brief review of 15 cases of hydatid mole, including 3 cases complicated by chorionepithelioma, demonstrates that in all cases the behavior of the hormone tests has been consistent with the clinical history. In two cases the hormone tests have determined early radical treatment. In one of these positive diagnosis even by exploratory curettage would have been impossible, and failure to recognize the significance of the hormonal test would have deprived the patient of early and curative treatment.



Fig. 5.—Case 3. Diffuse growth of chorionepithelioma invading the entire wall of fundus. Hemorrhagic portions have broken through endometrium.



Fig. 6.—Case 3. Microphotograph from hemorrhagic and necrotic portion of chorionepithelioma as seen in Fig. 5.

As indicated above, laboratory findings must not be regarded as wholly determinative in these cases. If they are positive they confirm the significance of the clinical behavior. Negative findings, however, cannot be implicitly relied upon as in all departments of medicine but, the principal basis of diagnosis and treatment must continue to depend upon history, course, clinical findings, and the common sense and surgical training of the attendant.

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IMPROVEMENTS IN THE PARALDEHYDE METHOD OF RELIEF OF PAIN IN LABOR

AN ANALYSIS OF 500 CASES

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SINCE the publication of our initial experience with paraldehyde as a basic agent for relief of pain in labor¹ development of certain helpful modifications in the technique has prompted us to summarize our more recent impressions of, and experience with this method.

Furthermore, in view of the outspoken criticism it behooves those who are already using established methods of relief of pain, or pioneering new methods, to justify the procedure by a frank and unbiased statement of results. If the method helps the expectant mother to face the coming ordeal of labor with less fear and apprehension, does not increase operative obstetrics, maternal or fetal morbidity or mortality and avoids the nervous shock frequently resulting from comprehension of the realities of labor, there remains no valid argument against its use. A physician's service to his patient in labor may vary from constant attendance throughout labor to a brief attendance at the actual delivery, but to those of the profession who remain with the patient throughout labor, there are probably very few, now using amnesic agents, who would be willing to go back to the former inadequate means of relief and be forced to endure the pleas of both the patient and family, to take some action which is often contrary to the best obstetric judgment.

We have continued to use paraldehyde with nembutal or sodium amytal, routinely, except in cases of primary inertia, some of the more serious complications of labor or in cases requiring the mother's cooperation as in a test of labor following a previous cesarean section.

We are still impressed with the desirability of withholding amnesia in primiparas until the cervix is well thinned out and dilated at least 4 or 5 cm., the head well fixed in the pelvis and the pains coming at intervals of three to four minutes. If some relief is needed prior to this, the administration of $\frac{1}{6}$ gr. of morphine, with $\frac{1}{300}$ gr. of scopolamine, by hypodermic, or the use of $1\frac{1}{2}$ gr. of nembutal, or 3 gr. of sodium amytal, will usually suffice.

In multiparas, also, we believe it is desirable to withhold amnesia until the head is fixed in the pelvis, the cervix fairly thin and dilated 2 to 3 cm., and the pains four to five minutes apart. Damon² in a recent article on pentobarbital-scopolamine amnesia in labor, also emphasizes the desirability of withholding the drugs until labor is well under way.

It would be unfortunate indeed, if, either through insistence on the part of the patient or over-indulgence on the part of the physician, amnesia should become an early first stage procedure, when pains are still irregular, the cervix uneffaced or the head still movable. Under such circumstances the physician would frequently be faced with the necessity of exceeding the recommended dose, permitting the patient to awaken undelivered or undertaking a more difficult operative delivery necessitated by the resulting inertia.

A more dependable and complete amnesia may be obtained if paraldehyde is preceded one to two hours by 3 gr. of nembutal, or 6 gr. of sodium amytal. In this respect no change has been made in the technique. If rapid action is desired, the contents of the capsules dissolved in one ounce of water, may be given twenty to thirty minutes preceding paraldehyde.

However, our method of administration of paraldehyde has been changed from rectal to oral in the great majority of cases. The principal reason for this change has been the occurrence, in several cases, of undoubted trauma to the upper rectum or lower sigmoid from the impact of the rectal tube in the attempt to inject the olive oil-paraldehyde solution sufficiently high to insure retention and rapid absorption. Even with the use of a fairly soft rectal tube and care in manipulation, trauma to the bowel wall may occur, as evidenced by tenesmus, localized pain and induration over the sigmoid and moderate fever, coming on four or five days after delivery. The condition has fortunately subsided within a few days but is nevertheless an unnecessary discomfort to the patient and worry to the attendant. The oral method is simpler, more easily entrusted to a nurse and is more rapid in action.

We have found that the great majority of patients willingly take paraldehyde by mouth, especially if they are already somewhat drowsy

from the administration of nembutal or sodium amytal during the preceding one or two hours. The initial dose of six drachms (24 c.c.) is stirred well in about two ounces of cold water. The patient should be raised to a sitting position in bed. Not more than a swallow should be taken at first, followed by a small piece of orange. If vomiting occurs, due to dislike of the drug or to having taken food too recently, it will occur usually within five minutes and very little of the dose will thus be lost. The stomach then being empty, or if no vomiting has occurred within five minutes, further swallows are taken at intervals of several minutes, until the entire dose has been taken within a period of fifteen to twenty minutes. The patient begins to sleep and amnesia is already present by the time the last swallow has been taken.

Subsequent doses of one to two drachms (4 to 8 c.c.) may be necessary if vomiting occurs or if the behavior or conversation of the patient indicates returning consciousness. The total dose rarely exceeds six to eight drachms (24 to 30 c.c.) of paraldehyde preceded by 3 gr. of nembutal or 6 gr. of sodium amytal. Should vomiting be persistent, it may then be necessary to administer paraldehyde in olive oil by rectal injection.¹ To lessen the possibility of vomiting, it is well to caution the patient to eat very lightly, if at all, at the onset of labor.

An objection most frequently mentioned, in opposition to amnesia during labor, is the troublesome degree of restlessness which is sometimes seen. It is most pronounced in patients of a highly nervous or excitable temperament, but it must be remembered that patients of this type are noisy and restless without any medication. Large doses of barbiturates accentuate this reaction. It is only logical, however, to expect it to occur to some extent in any method of amnesia, as a natural reaction to painful stimuli, unchecked by any voluntary control.

With paraldehyde as a basic amnesic agent, using only a small dose of barbiturate, such cases of exaggerated motor or psychic activity occur in only a small percentage of patients and may be controlled by a dose of morphine. Exceptionally, it may be necessary for the attendant to desist from all further attempts to maintain amnesia and endeavor to arouse the patient as soon as possible.

The uncertainty as to a patient's behavior, while in an amnesic state, makes it necessary to have a nurse or dependable assistant with the patient throughout labor. Her task of controlling a patient who shows some degree of restlessness during labor is rendered much simpler and the patient is protected from chance of self-contamination of the vulva or injury, by the use of wrist pads and restraining leather cuffs fastened to each side of the bed by which the movement of the arms is restricted and the patient kept on her back. The eyes are not covered or the wrists restrained until at least one hour after the dose has been given, and the patient thoroughly asleep. We use this degree of restraint in

almost all cases and consider it an essential requirement. Patients occasionally remember the wrists having been restrained, even though they have no memory of the labor pains.

It has been our experience as well as that of others that in many cases a short period of moderate inertia occurs soon after the administration of paraldehyde. It is manifest in a slowing of the pains from three- or four-minute to five- or six-minute intervals but seldom continues more than one hour. It is a help rather than a disadvantage, for it enables the state of sleep and amnesia to be established with less disturbance by the pains.

Stimulation of the pains is not necessary unless the inertia persists for more than one hour after the patient is asleep. Herein lies the importance of withholding the paraldehyde until the character of the pains, condition of the cervix, and descent of the head, indicate that labor is well established. If used too early in labor, this period of inertia will tend to be prolonged, persistent and more difficult to overcome. We have made frequent use of artificial rupture of the membranes just preceding the administration of paraldehyde or just after amnesia is fully established, to further insure efficient pains and good progress. This has proved to be a helpful and harmless procedure, provided the head is fixed, the cervix thin and dilated 4 to 5 cm., and the pains occurring at three- to four-minute intervals.

In the majority of cases there is a spontaneous increase in the frequency and strength of the pains within one hour. If inertia persists beyond this period, several drops of pituitary extract should be instilled onto the nasal mucous membrane, using a hypodermic syringe as a dropper. This is preferable to plugging the nostril with cotton saturated with pituitary extract, as it is less likely to irritate or arouse the patient. There is a definite effect within five to ten minutes, but one practically never encounters the severe type of reaction, with prolonged tonic contraction and slowing of the fetal heart sounds that is likely to occur with the subcutaneous administration. There would undoubtedly be greater safety for both mother and baby if the intranasal, rather than the subcutaneous administration of pituitary extract were more generally used during labor. In many cases not more than one intranasal instillation of pituitary extract is necessary, the pains continuing with normal frequency and strength to the end. The patient makes bearing down, expulsive efforts in the second stage with almost the same efficiency as if she were awake.

Restlessness during or between pains may seriously interfere with preparing and draping the patient for delivery and controlling her during crowning of the head. This has been overcome by a modification in technique which we have found to be safe and most satisfactory. Ether, a mask, and a sterile towel are kept conveniently at hand in the labor room. When crowning has begun and the head remains slightly

visible between pains in the multipara, or has produced slight tension on the perineum in the nullipara, ether is dropped onto the mask held high enough over the patient's face to avoid choking or realization that ether is being administered. Careful induction of anesthesia is necessary to avoid memory of this event and imperfect amnesia. Within a few minutes the mask may be lowered to the patient's face and the stage of primary anesthesia reached. Meanwhile the nurse should have finished scrubbing by the time the patient is anesthetized and moved to the delivery room. The head may be held back with the sterile towel should it progress too rapidly before anesthesia is established. While the nurse is preparing and draping the patient, the physician scrubs and is gowned and gloved. Only a small amount of ether is given while the patient is being prepared for delivery. She is relaxed and quiet and there is no interference with the preparation. Pains usually recur by the time the patient is draped and delivery occurs spontaneously, aided, if necessary, by episiotomy or hypodermic administration of two or three minims of pituitary extract.

By this method it is possible to carry out an orderly obstetric technique, protect the patient from contamination, permit a natural birth in the majority of cases and lessen the physical strain on the part of the attendants. For those who prefer to do routine low forceps delivery, it further simplifies the forceps delivery and lessens the extent of the episiotomy.

The placenta is usually ready to be delivered by simple expression in seven to eight minutes and there is no tendency to postpartum hemorrhage. As a precautionary measure, however, it is best to give one of the newer ergot preparations by hypodermic injection, immediately after delivery of the placenta.

In our first report, it seemed that the degree of interference with prompt establishment of the infant's respiration and cry at birth was negligible. However, with further experience with the method and the use of some additional ether just before delivery, according to the technique above described, we have noted a tendency to a short period of apnea after birth and some sluggishness in the establishment of regular breathing and vigorous crying in 12 per cent. The condition would seem to be due rather to a state of drowsiness, than to a specific depression of the respiratory center. If morphine has been administered within three or four hours before delivery, this behavior is more likely to be noticed.

In full-term normal babies, some degree of apnea or sluggishness apparently has no detrimental effect, as a little stimulation by spanking or gentle mouth to mouth inflation of the lungs promptly establishes good respiration and crying. It is probably true, however, that with premature infants, this sluggishness may predispose to atelectasis. It

seems best in such cases to give coramine at birth to stimulate crying and aid in full expansion of the lungs. The infant should be turned to the lateral or prone position with the foot of the crib raised somewhat, to facilitate drainage of mucus from the air passages. Aside from drowsiness, the first twelve to twenty-four hours after birth the babies show no difference in nursing, behavior, gain in weight, etc.

To protect the patient from possible harm, should she awaken in a dazed condition some hours after delivery, our former routine was to place the bed against the wall and fasten a chair to the opposite side. More recently we have been using a belt consisting of a strip of unbleached muslin four inches wide and sufficiently long to permit clamping each end to the metal structure of the bed. To the center of this strip is sewed a strip of the same material and width which is buckled about the patient's waist. This permits turning from side to side but does not allow her to roll to the edge or get out of bed. It is removed as soon as she has awakened and is rational.

As the effect of the drugs begins to wear off after some hours, the return to consciousness may occasionally be accompanied by restlessness or emotional disturbance, until the patient is fully awake. It has been found most helpful to administer $\frac{1}{6}$ gr. of morphine by hypodermic injection at the first evidence of restlessness or returning consciousness. This insures a longer period of rest and quiet, from which the patient awakes fully conscious and rational. The family should not be allowed to disturb the patient during this period of rest.

Analysis of the last 500 consecutive cases in which paraldehyde was used shows that complete amnesia was obtained in 92.6 per cent and partial amnesia in 6.2 per cent. Since the "islands of memory" of the latter group concern events of little significance to the patient and carry no recollection of pain, we are justified in stating that complete amnesia as to pain, may be obtained in 98.8 per cent. Failure was noted in 1.2 per cent. This represents a very low incidence of idiosyncrasy or resistance to the usual effects of the drug.

The average duration of amnesia before delivery was five hours and twenty-four minutes in nulliparas and three hours and eighteen minutes in multiparas. The average duration of sleep after delivery was four hours and forty-eight minutes in nulliparas and five hours and thirty-six minutes in multiparas. The hours of sleep during and after labor account for the feeling of rest and well-being so frequently noticed when these patients react.

The total duration of labor was thirteen hours and eighteen minutes in nulliparas and eight hours and fifty-four minutes in multiparas as compared to sixteen hours and thirty minutes in nulliparas and eight hours and forty-five minutes in multiparas under the former routine of nembutal-morphine, nitrous oxide and ether.

Excitement under the paraldehyde method is defined as constant motor and psychic activity, both during and between pains manifested by loud outcry, and efforts to sit up or get out of bed. It occurred in 2.8 per cent. A dose of pantopon or morphine is of great benefit in these cases. Restlessness is defined as a moderate degree of psychic and motor activity, present during, but not to any troublesome extent between, the pains. It occurred in 7.2 per cent. In attributing restlessness and excitement to the drugs used, in fairness we should remember that the same reactions are noted as frequently in labors conducted without drugs, in patients of a certain type. To most attendants and families noise and restlessness are better endured if there is assurance that the patient does not realize what she is doing and will have no recollection of it.

A moderate degree of uterine inertia was noted in 12.8 per cent, as compared to 13 per cent without paraldehyde. We refer to persistent inertia rather than to the short temporary inertia which occurs so frequently immediately after administration of the paraldehyde. The figures, therefore, do not indicate any troublesome degree of inertia with paraldehyde, and the intranasal use of pituitary extract, when indicated, will be found to be both adequate and safe.

Under our former method of relief of pain in labor, morphine was used more frequently and fetal apnea at birth occurred in 17 per cent. Under the paraldehyde method, apnea at birth was noted in 11.6 per cent. It appears to be due to a state of drowsiness rather than to a specific depression of the respiratory center and responds easily to mild stimulation or a few gentle mouth to mouth inflations of the lungs.

It is admitted that estimates of the amount of blood lost in labor are likely to be inexact, but nevertheless will serve to compare the incidence of postpartum hemorrhage. Assuming an estimate of 500 c.c. or more of blood as a postpartum hemorrhage, this degree of hemorrhage was found in 6 per cent under our former routine as compared with 2.6 per cent under paraldehyde. The greater amount of rest during labor and the smaller amount of ether used may be factors in this improvement.

Spontaneous delivery occurred in 81.2 per cent as compared with 79 per cent under our former routine. The involuntary bearing down efforts are excellent in the majority of cases, but since they are probably not quite as efficient as the voluntary efforts of the patient who is awake, we have compensated for this to some extent by the intranasal administration of pituitary extract in 37 per cent, and the more frequent use of episiotomy under novocaine, to remove the resistance of the perineum during the latter stages of crowning.

Low forceps were used in 11 per cent and midforceps in 7.8 per cent under paraldehyde, as compared with 10 per cent and 8 per cent in our former routine.

In our first report on paraldehyde there was no fetal mortality in the series of 100 cases under paraldehyde, and no fetal mortality in the series of 100 patients delivered prior to the use of paraldehyde. In the present series of 500 cases the uncorrected fetal mortality was 1.8 per cent. Analyzing the nine natal or neonatal deaths, we have eliminated a case of hydrocephalus delivered by craniotomy, a premature infant weighing $3\frac{3}{4}$ pounds, a case of abruptio placentae in which the fetal heart sounds ceased early in labor before paraldehyde was administered, and a stillbirth apparently due to premature rupture of the membranes, intrapartum infection (103° F.), prolonged labor, contraction ring, and difficult midforceps delivery. The corrected fetal mortality is 1 per cent, computed from the following cases:

A slightly premature infant (eight and one-half months) which died one hour after delivery, clinical and autopsy diagnosis, atelectasis; a full-term infant delivered by low forceps following persistent and increasing slowing of heart sounds, apparently due to pressure on a coil of cord around the neck; a slightly premature infant (eight and one-fourth months) which died one hour after delivery, clinical and autopsy diagnosis, atelectasis; a premature infant (5 pounds 7 ounces) which lived two days, clinical diagnosis, atelectasis; and a premature infant (eight and one-fourth months) which died six hours after birth, clinical diagnosis, atelectasis.

On the basis of this low natal and neonatal mortality (1 per cent), it may be said that paraldehyde has no harmful effect on full-term normal infants. If used in cases of premature labor, the administration of coramine may be advisable at birth, to aid in full expansion of the lungs and lessen the possibility of atelectasis.

As mentioned in our first report, there seemed to be no contraindications to the use of this method in home confinements. This has been verified by reports from several general practitioners in small communities who have been using it with very satisfactory results.

To summarize our more recent experience with paraldehyde in labor, we believe that complete amnesia as to pain can be obtained in fully 98 per cent of cases; that the technique has been simplified by oral administration of the drug; that facilities for restraint of the patient's wrists to the side of the bed should be available, to better protect the patient and lighten the duties of the attendant; that pituitary extract dropped into the nose is a valuable and safe aid in overcoming any prolongation of a temporary inertia; that control of the patient for final cleansing, draping and delivery is greatly facilitated by the induction of light primary ether anesthesia during crowning of the head, just before moving the patient to the delivery room; that a mild degree of apnea or sluggishness in breathing or crying is to be expected in about 12 per cent of full-term, normal babies but is of no serious significance and is easily overcome, and that if paraldehyde is given in premature

labors, coramine should be given to induce more prompt and thorough expansion of the lungs. The incidence of forceps delivery is not increased.

It has been a gratifying experience to note the confidence with which patients approach the time of labor, the refreshed state in which they react some hours after delivery, and the oft-repeated statement that the relief experienced had removed the dread of a future labor.

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EPIDURAL ANESTHESIA IN OBSTETRICS

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IN THE Charity Hospital of New Orleans, we have attempted to add to the anesthetic armamentarium of the obstetrician another procedure, epidural anesthesia, which we have thus far administered to 76 patients.

ANALYSIS OF CASES

TABLE I. OBSTETRIC CASES WITH EPIDURAL ANESTHESIA

AGES	11-20	20-30	30-40
No. of Cases	23	46	7
73			
White	31	Colored	45

The age group varied from our youngest patient eleven years of age to forty years, the majority of the cases falling in the age group between twenty and thirty years. There were 45 colored patients and 31 white patients to whom the anesthetic was given.

TABLE II. TYPES OF DELIVERY

Spontaneous	23 cases
Low forceps and episiotomy	24 cases
Midforceps	9 cases
Cesarean sections	10 cases
Versions and extractions	3 cases
Dührssen's	1 case
Embryotomy	1 case
Twins with Piper's forceps	1 case
Precipitation	1 case
Seanzoni and episiotomy	3 cases

It can be seen from this table, that all the major obstetric procedures can be handled with ease and with the conscious cooperation of the patient. The only procedure which we would not advise performing under epidural anesthesia is version and extraction. This might prove difficult because the uterine contractions continue unabated under the anesthesia, and for version one needs relaxation in order to accomplish it easily without danger to mother or child. This point was also brought out by M. P. Rucker⁴ in 1930.

TABLE III. POSITIONS AND PRESENTATIONS

O. L. A.	24
O. D. A.	5
O. D. P.	6
O. D. T.	4
L. S. P.	2
O. L. T.	2
O. L. P.	2
Not recorded	30
L. S. A.	1
	--
	76

The positions and presentations of the deliveries are included so that the reader may see the variety of cases dealt with.

TABLE IV. CESAREAN SECTIONS (10)

Indications:	
1. Central placenta previa (placenta covered $\frac{3}{4}$ of os).	
2. Contracted pelvis with x-ray evidence of fetopelvic disproportion.	
3. Generally contracted pelvis with x-ray evidence of fetopelvic disproportion.	
4. Flat pelvis with x-ray evidence of fetopelvic disproportion; maternal signs of exhaustion.	
5. Generally contracted pelvis (previous cesarean section done).	
6. Postmaturity, contracted pelvis with x-ray evidence of fetopelvic disproportion.	
7. Generally contracted pelvis with x-ray evidence of fetopelvic disproportion.	
8. Flat pelvis, fetopelvic disproportion, rheumatic heart disease (Sterilization and section).	
9. Generally contracted pelvis, previous cesarean section.	
10. Chart not available.	

The procedure which we have followed in administering epidural anesthesia is that which Dr. Charles B. Odom² described in his recent article.

I should like to emphasize a point brought out by Odom that "the back should not be arched until all has been prepared prior to the introduction of the needle into the epidural space. The flexion of the back causes an inflow of blood into the peridural venous plexus which might dilate the veins and compensate in part for the increased negative pressure and at the same time increase the likelihood of venous puncture." We had some difficulty in visualizing the movement of the fluid in the indicator until we utilized this point and one brought forth by Bonniot,⁹ who observed

that the negative pressure in the epidural space changes with the change in the position of the patient. Bonniot states that when the patient is placed on an incline of 35 degrees the pressure passes from minus $\frac{1}{2}$ cm. to minus 5 cm. of water and when returned to horizontal the pressure returns again to zero.

We have been using the second lumbar interspace as a routine to enter the epidural space. Cleland's⁵ brilliant experimental and clinical studies show that the uterus is supplied by the eleventh and twelfth thoracic roots and the birth canal by certain undetermined sacral roots. In utilizing the second lumbar interspace, we are in close enough proximity to the eleventh and twelfth thoracic roots to obtain excellent anesthesia of these roots by diffusion of the anesthetic solution. This interspace is also advantageous in that the epidural space is larger in this region than higher up in the spinal canal (Odom, Houdard, Judet, Mathey¹¹) and the spinous processes of the vertebrae come off in a horizontal plane, whereas, higher up they come off in a more vertical plane, making for difficulty in the injection of the anesthesia (Giordanengo¹⁰).

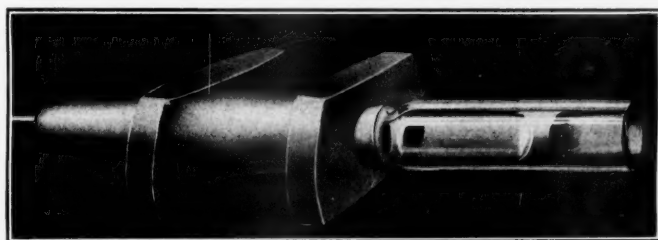


Fig. 1.—Spinal needle with glass indicator in place partially filled with water. Negative pressure in epidural space draws the water inward.

AMOUNT OF ANESTHESIA

The amount of anesthetic solution used has been changed from time to time in trying to find a solution in which the duration of the anesthesia was lengthened. The patients in the recent cases on our service (32) were given 500 mg. of novocaine and 2 ampules of 1 per cent Pantocain dissolved in 50 c.c. of sterile saline. This mixture gave an anesthesia lasting from one and one-half to two hours.

TABLE V. AMOUNT OF ANESTHETIC USED

500 mg. novocain	}	32 cases
2 ampules pantocain		
60 c.c. 1 % procaine		13 cases
50 c.c. 1 % procaine		2 cases
50 c.c. $\frac{1}{10}$ % pantocain		2 cases
50 c.c. $\frac{9}{10}$ % procaine	}	3 cases
1 % pantocain		
100 c.c. 1 % procaine		3 cases
Not recorded		21 cases

ONSET OF ANESTHESIA

The onset of the anesthesia was observed to vary considerably after the injection of the anesthetic solution. In some cases the patients were given almost immediate relief and in others, twenty to thirty minutes elapsed before the patient was relieved of the pains of uterine contractions.

The uterine contractions were not interfered with in any of the cases. They continued unabated and often seemed increased in frequency and intensity. This was reported by M. P. Rucker who discussed the action of adrenalin as cause for delay in uterine contractions after the administration of the anesthetic. He no longer uses adrenalin unless especially indicated, and observed that the pains continued. The action of adrenalin on uterine contractions is also discussed by Bourne and Burns.⁷

TIME OF ADMINISTRATION OF ANESTHETIC

In administering the anesthesia, we have attempted to determine how soon the patient would deliver so that the anesthesia would not wear off before delivery occurred. We knew that the anesthesia lasted from one and one-half to two hours and attempted to judge the cases individually and according to the procedure anticipated in order to complete the delivery. We found in primiparae that, if we gave the injection when the cervix was almost completely dilated and the head was at station 0 to plus 1, the patient had a painless second stage of labor and that after delivery, we had time to repair episiotomies or lacerations, if they occurred, without any additional anesthesia. In multiparae, it was more difficult to determine the time to administer the anesthesia. We chose the time at which the patient was having strong, regular contractions and the cervix was 4 cm. or more dilated. In a few cases in which we misjudged the time of delivery, it was necessary to supplement the epidural anesthesia with nitrous oxide in order to terminate the labor.

We at no time saw asphyxia in the newly born infants which could be attributed to the use of the epidural anesthesia.

The third stage of labor is also benefited by this form of anesthesia in that the tonicity of the uterus is not interfered with and blood loss is lessened.

RESULTS

TABLE VI. RESULTS

Good	68
Partially successful	5
Reactions	3

We have three patients who had a reaction to the anesthetic. One case was a mild reaction during which the patient had an excited facial expression, with increased respiration and pulse rate; she became pale

and broke out in cold perspiration. We administered adrenalin and caffeine and she promptly was relieved and began feeling better. The second case occurred in one of our cesarean sections. After the anesthetic was administered the patient was prepared and draped. She then became excited, moved her lips as if trying to talk but was unable to utter a sound. She became very pale and passed into profound shock. The respirations ceased and artificial respiration was started. The pulse rate remained good for a short time but this too soon became imperceptible. The head was lowered, intravenous adrenalin (minims X) and seven and one-half gr. caffeine administered, and an infusion started. It was feared for a time that the patient had died. A quick cesarean section was performed in order to save the infant from asphyxiation and a normal child with spontaneous cry and respiration was delivered. After the delivery of the infant the patient slowly rallied, the pulse became bounding and rapid (probably from the effects of the adrenalin), and spontaneous respirations were resumed. The operation was completed as quickly as possible; acacia was started intravenously and external heat applied. The patient made an uneventful recovery and was discharged from the hospital in twelve days.

The third case with a reaction was a primipara who apparently received some of the procaine solution into the subarachnoid space, as she lost consciousness, and it was with difficulty that respiration and circulation were restored. Heroic doses of ephedrine and adrenalin and the use of the Drinker respirator were necessary to bring the patient back to consciousness. However, there were no deleterious effects manifested when the birth of the child with low forceps took place. The child cried lustily after it was born and both mother and child made uneventful recoveries.

The reactions which we had were attributed to two causes: Either, owing to some fault in the technique, the anesthetic was given into the subarachnoid space, or the patient had a sensitivity to the novocaine solution used. The operator must be extremely careful in administering the anesthetic to make sure that the anesthetic solution is entering the epidural space and that he has not traversed this space and is depositing the solution into the subarachnoid space.

CONCLUSIONS

1. This form of anesthesia should be part of the armamentarium of every experienced obstetrician and anesthetist.
2. The anesthetic can be administered to all patients in the child-bearing age.
3. All the major operative obstetric procedures can be performed under this form of anesthesia safely and with the conscious cooperation of the patient, except in version.

4. Although there are dangers in the administration of the anesthetic, care coupled with the negative pressure technique all but obviates them.

5. The uterine contractions are not interfered with after giving the anesthesia; there is no asphyxia in the newborn ascribable to the anesthetic; and blood loss is lessened in the third stage due to the tonicities of the uterus.

6. The reactions which occurred were probably due to either faulty technique or sensitivity to the anesthetic solution.

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A RÉSUMÉ OF ONE HUNDRED CONSECUTIVE CASES OF ECTOPIC PREGNANCY

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THIS study was made from the records of 100 consecutive cases of ectopic pregnancy treated in the Surgical Division of the City Hospital of Akron during the five-year period from 1931 to 1936.

In this series, the patients for the greater part were admitted late and therefore the Friedman test, necessitating a forty-eight-hour delay, was not considered a justifiable procedure. It might, however, have been of some value were it used in the early unruptured cases.

There were 95 white and 5 colored women ranging from eighteen to fifty years of age. Of these, 95 were married and 5 were single. In this hospital the ratio of black to white admission runs about 5 per cent. There were 22 patients who were eighteen to twenty-five years of age, 59 who were twenty-five to thirty-five, 18 whose ages fell between thirty-five and forty-five, and 1 past forty-six.

From the histories examined it was found that 28 patients had experienced 1 to 7 previous abortions. Of 38 patients, 14 had had 1 child; 17, 2; and 7, 3 or more. Three patients had had 1 stillbirth each, delivered at term. The above births were exclusive of two classical cesarean sections.

The occurrence of previous pelvic inflammation as regards history was evident in 21 patients. Of these, 6 gave histories of Neisserian infection, 3 had had "pus tubes," and 7 had experienced longer or shorter febrile periods postpartum. One patient, five years prior to her ectopic pregnancy, had undergone a vaginal hysterectomy on her second day postpartum because of complete inversion of the uterus.

Including the vaginal hysterectomy noted above, 12 patients had had previous abdominal operations. These are outlined in Table I.

TABLE I. PREVIOUS OPERATIONS

CASES	OPERATION	YEARS BEFORE ECTOPIC PREGNANCY	DIAGNOSIS
3	Appendectomy	3, 7, 2	Acute appendicitis
3	Salpingo-oophorectomy 2 right, 1 left	3, 2, 6	Ectopic tubal pregnancies
1	Vaginal hysterectomy	5	Postpartum eversion of uterus
2	Classical cesarean section	6, 10	Placenta previae, disproportions
3	History of previous pelvic laparotomy	3, 7, 4	Pus tubes

As regards relative sterility there were 32 patients who had not conceived in a period of five years or longer prior to the ectopic pregnancy. This is in keeping with the previously published reports found in the recent literature.

Of the 100 cases herein reported, 31 patients gave a history of 1 to 3 attacks of fainting. Twenty-seven gave histories of weakness or dizziness and in 20 patients fainting was denied. There was no reference to these symptoms in the remaining 22 histories.

Pain was the most common subjective symptom: it occurred in 95 cases, 56 times on the right side and 39 times on the left side. It is interesting to note here that there were 55 right and 42 left ectopic pregnancies. The character of pain complained of was described as being "knife-like" in 43 cases. Since there were 78 cases of rupture it follows that tearing of the peritoneal coat does not, in every instance, account for the sudden "knife-like" pain. "Sticking" pain was commonly complained of and more often in the unruptured cases. Three patients gave histories of severe right shoulder pain.

Amenorrhea was the next most common symptom: 62 patients had missed 1 or more periods. In this classification 34 patients had not missed any period. However, upon closer questioning they either menstruated earlier or later than the expected date. Bleeding or spotting after a more or less irregular menstrual period was a chief complaint. Seventy-four patients presented this complaint as noted in Table II.

TABLE II. PERIODS MISSED AND NUMBER OF DAYS OF BLEEDING OR SPOTTING

PERIODS MISSED	CASES	NO. OF DAYS OF BLEEDING OR SPOTTING AFTER AN IRREGULAR MENSTRUAL PERIOD	CASES
0	34	No bleeding	22
1	34	1 to 10 days	22
2	19	10 to 15 days	17
3 or more	9	15 to 25 days	10
No record	4	25 or more	25
		No record	4

The spotting was rather irregular since as many as 5 days would elapse during which time there was no bleeding or staining. In 23 cases patients gave a history of having passed "clots." In no instance were these examined, either grossly or microscopically. If the patients could be instructed to save these "clots" or shreds of tissue, a histologic examination would in many instances reveal the correct diagnosis. It is known that a decidual reaction is produced in the uterus, even if the pregnancy occurs outside this cavity and chorionic villi are found only where the products of conception are implanted.

The patients gave histories of having been sick for from one to fifteen weeks. In Table III the periods of illness in weeks are given.

TABLE III. DURATION IN WEEKS OF ILLNESS PRIOR TO OPERATION

	CASES
Less than 1 week	18
1 to 2 weeks	28
2 to 3 weeks	12
3 to 4 weeks	17
More than 4 weeks	22
No record	3

Sixteen patients remained in the hospital from two to six days before operation. Of these, only 4 including the abdominal pregnancy were suspected of having an ectopic pregnancy according to the records. The patient with the abdominal ectopic pregnancy remained in the hospital under observation for seven days prior to operation. The correct diagnosis was suspected when first seen. However, it became definite only after the patient suddenly went into shock. At operation a five months' fetus and placenta were removed without event. The abdomen contained about 2,000 c.c. of free blood. In the remaining 12, the preoperative diagnosis was as follows: 3 acute or chronic salpingitis, 2 acute appendicitis, 3 twisted ovarian cysts, 1 ovarian cyst, and 3 infected incomplete abortions.

The preoperative leucocyte count, differential and the hemoglobin determination were noted in 89 cases and their ranges are given in Table IV.

TABLE IV

WHITE BLOOD COUNT	CASES	POLYNUCLEAR LEUCOCYTES	CASES	HEMOGLOBIN (SAHLI)	CASES
Less 10,000	29	Less 70%	22	Less than 50%	26
10,000 to 15,000	26	70% to 75%	30	50% to 70%	39
15,000 or more	34	75% to 80%	20	70% to 100%	24
No record	11	80% or more	17	No record	11
		No record	11		

Shock was evident in 28 of the patients admitted. This diagnosis was made on the basis of subnormal temperature, pallor, thready pulse, and low blood pressure. Of the 28 in shock, 26 were correctly diagnosed as ruptured ectopic tubal pregnancy. The remaining 2 were diagnosed as ruptured peptic ulcer in one case and ruptured ovarian cyst in the other. This is excusable since the one patient diagnosed as ruptured peptic ulcer had given no history referable to the pelvis, but did give a long history of ulcer distress. The case diagnosed as ruptured ovarian cyst was seen for the first time in the Outpatient Department and gave no history of amenorrhea, subsequent bleeding, or pelvic pain. She had been told by a doctor in the past that an ovarian cyst was present.

Pelvic examination was recorded in 90 cases and the more important findings noted in Table V.

TABLE V. FINDINGS ON PELVIC EXAMINATION IN ECTOPIC PREGNANCIES

VAGINAL BLEEDING	SLIGHT UTERINE ENLARGEMENT	PAIN ON MOTION OF CERVIX	ADNEXAL MASS	BULGING OF CULDESAC
62	57	85	89	67

In one instance only was Cullen's sign (discoloration around umbilicus) noted and that was in a patient who had had a previous classical cesarean section.

As a preoperative measure cul-de-sac puncture was recorded 4 times. In each instance fresh or clotted blood was aspirated and the patient was submitted to immediate laparotomy.

Bush⁵ presented 161 cases in 1934 of which 46 had diagnostic puncture. He advised that this procedure be used more frequently, and also suggests using a large caliber needle so that small blood clots would not obstruct the lumen and give a false test. This author points out a possible fallacy of the test in that ruptured corpus hemorrhagica will frequently produce copious intra-abdominal hemorrhage. Greenhill⁶ reports three of his own cases and in addition collected 77 others from the literature where abdominal hemorrhage was produced by corpus hemorrhagica rupture.

Twelve patients had dilatation and curettage prior to laparotomy as a diagnostic procedure. The finding of normal or hypertrophic endometrium in a patient whose symptoms and signs suggested ectopic pregnancy or threatened abortion is a diagnostic aid in favor of the former.

Colpotomy was done in 4 instances. These patients were operated upon early in the five-year period. "T" tubes were inserted and immediate laparotomy instituted. All of these patients except one had long hectic postoperative recoveries.

Of this series there was a correct diagnosis in 80. This percentage of correct diagnosis is in keeping with those recently reported by James and Lafferty,⁷ Meagher,⁸ and Folk and Rosenbloom.⁹

TABLE VI. POSITION OF RUPTURED AND UNRUPTURED ECTOPIC PREGNANCIES FOUND AT OPERATION

Ruptured right	43
Ruptured left	35
Unruptured right	12
Unruptured left	7
Ruptured abdominal pregnancy with hemorrhage	1
Not stated	2

Of the 100 cases investigated, 78 patients presented ruptured ectopic tubal pregnancies. At operation large quantities of free and clotted blood were found in the abdomens of 68 and an estimate of more than 200 c.c. in the remaining 10.

The 100 operations were done by fifteen different operators. In three cases during the early period of this series, drains were inserted after the bleeding structure was removed. From the records there was no evidence of acute inflammatory condition necessitating drainage mentioned. However, these early records were not always complete. These patients in the drainage cases did poorly and one died.

FATALITIES

CASE 45210.—Patient, white, aged thirty-two years, para iii, gravida iv, last baby seven months old, gave a history of miscarriage five months ago but was not attended by a physician. She had had slight vaginal bleeding and right abdominal pains for past six days. The menses had not become established since last pregnancy. For past three days there had been nausea and vomiting, and pains in the lower abdomen for the past two days had been sharp and intermittent. She was an obese white female of stated age who did not appear acutely ill.

Pelvic examination: There was a right adnexal mass the size of an orange which was extremely tender and seemed to be attached to the uterus. Motion of the cervix caused pain. Blood pressure, respiration, pulse, and temperature were all normal. Hemoglobin was 11.1 gm./100 c.c., R.B.C. 3.9 million, W.B.C. 13,400. Patient remained in the hospital for six days, after which time a surgeon was consulted and decided to operate for "right pelvic mass." Operation revealed unruptured right ectopic pregnancy. The sac was incised, fetus removed, and the sac packed with gauze. Sutures were placed through the sac and broad ligament and the abdomen was closed, leaving a drain tube in place. One hour after operation the patient was given 400 c.c. of whole blood and 1,600 c.c. of saline intravenously. She died two hours later, supposedly of hemorrhage. No autopsy was performed.

CASE 69321.—Patient, white, aged twenty-four years, para ii, gravida iii, considered herself three months pregnant. Her last period occurred three months before admission. She gave a history of having had crampy pains in the left lower abdomen for past week. About twenty-four hours prior to admission, while straining at stool, she had a severe knifelike left lower abdominal pain that caused her to faint. Patient was first seen the next morning when she was sent to the hospital. She appeared acutely ill. Her blood pressure was 70/50, and pulse 130. The abdomen was dull in both flanks and markedly distended. Immediate operation was done, and a ruptured left tube and a three months' intact fetus were found free in the abdomen. Left salpingo-oophorectomy was completed. About 4,000 c.c. of fresh blood were aspirated aseptically and were autotransfused into the patient's basilic vein. Her condition remained poor, and she died four hours postoperatively in profound shock. No autopsy was performed.

CASE 50723.—Patient, white, aged twenty-three, para ii, gravida iii, had her last period nine weeks previously. There had been spotting almost continuously for this period, and for the last five weeks there was intermittent colicky pain in the left side of the abdomen. The night prior to admission, while hanging curtains, patient had a severe left lower quadrant knifelike pain which caused her to faint. She remained in bed until next morning when she was admitted to the hospital. Pelvic examination revealed a left adnexal mass, the size of an orange, and a distended cul-de-sac of Douglas. Preoperative laboratory work revealed 13.9 gm. Hb, 4.1 R.B.C., 12,600 W.B.C., with 71 per cent polymorphonuclears. Patient immediately was laparotomized and a ruptured left ectopic pregnancy was found. There was about 1,000 c.c. of fresh and clotted blood free in the abdomen. We did a left salpingo-oophorectomy and a right salpingectomy. No transfusions were given. The patient died twelve hours postoperatively, very suddenly, and the cause of death, revealed by autopsy, was bilateral atelectasis. Both lung bases were filled with antemortem thrombi.

CASE 50797.—Patient, white, nullipara, aged twenty-eight years, had always had normal menses until five weeks previously, at which time she began to menstruate and has continued to spot and bleed ever since. She had had "sticky" pains in right lower abdomen for past ten days; however, these had never been severe. The patient did not appear acutely ill. She had direct and rebound tenderness in the right lower quadrant, supposedly over McBurney's point. Hemoglobin was 80 per cent, W.B.C. 11,300, with 82 per cent polymorphonuclears, and the urine was negative. Preoperative diagnosis was chronic appendicitis with uterine hemorrhage. At operation a ruptured left tube with about 100 c.c. of free and clotted blood in the abdominal cavity was found. The ectopic pregnancy was in the ampullar end of the tube and appeared as an ectopic abortion in progress. The surgeon did a left salpingectomy, appendectomy, and cholecystectomy (for gallstones). The operation took one hour and fifteen minutes. The patient had a very stormy course and died on the sixth day of generalized peritonitis. No autopsy.

CASE 70738.—Patient, white, aged twenty-three years, no previous pregnancies in her four years of married life. Her last period was in September. However, she began to bleed in October and continued to spot and have intermittent profuse vaginal bleeding to date. About ten days prior to admission the patient had a rather severe right lower abdominal "colicky" pain. She was observed for five days at home by her family doctor without a definite diagnosis. She was pale, appearing acutely ill. Her blood pressure was 80/50, pulse 150, and temperature 101.8° F. The abdomen was distended, very tender in the right lower quadrant, and there was definite dullness in both flanks. Pelvic examination: Right adnexal mass size of an orange appearing in cul-de-sac of Douglas which was pushed forward. Diagnosis: ruptured ectopic tubal pregnancy. Hemoglobin was 50 per cent, W.B.C. 17,800, with 85 per cent polymorphonuclears, and the urine was negative. Operation under ether anesthesia revealed right ruptured tubal pregnancy. After doing a right salpingectomy, 3,000 c.c. of aspirated blood were transfused and there were 4,500 c.c. of fresh and clotted blood in the cavity. The fetus was intact in the "sac," and it appeared of about two months' size. The patient began coughing on the first day and died on the third with a diagnosis of right lobar pneumonia. No autopsy was performed.

From Table VII it will be seen that in addition to the removal of the bleeding ruptured tube, 43 ovaries were extirpated. It is clear that removal of the ruptured salpinx alone is not always feasible. Occasionally the ovary is so agglutinated to the ruptured tube that separation without the risk of increased hemorrhage or of subsequent bleeding is not considered possible. It would seem, however, that greater conservatism could have been practiced in this series. Unnecessary extirpation of the ovarian tissue in such a group may be of serious moment. However, great care in the matter of conservatism was also evident on the part of several of the operating surgeons. Additional surgery such as appendectomy, hysterectomy, uterine suspension and cholecystectomy is, of course, unwarranted. In 2 of the 5 patients who died additional surgery was evidently a contributing factor.

TABLE VII. STRUCTURES REMOVED AT OPERATION

Bilateral salpingectomy and oophorectomy	14
Unilateral salpingectomy and oophorectomy	43
Salpingectomy	42
Appendix along with primary operative procedure	22
Hysterectomy along with primary operative procedure	4
Suspension along with primary operative procedure	2
Cholecystectomy along with primary operative procedure	1
Gauze pack of affected tube	1

Transfusion of whole blood was used 12 times and autotransfusion given 22 times. The average amount of whole blood given was 500 c.c. and the average amount of autotransfusion was 1,700 c.c. The greatest amount of blood aspirated from the abdomen and replaced into the general circulation was 3,700 c.c. This method of replacing blood lost has proved very effective in this institution and is to be highly recommended. The free blood is aseptically siphoned into a flask containing 25 c.c. of 5 per cent sodium citrate to each 500 c.c. of blood and immediately inserted usually into the basilic vein by gravitation. There have been no demonstrable ill-effects to date from the autotransfusions given.

The postoperative convalescence was satisfactory in all the recovery cases except those submitted to posterior colpotomy with "T" tube drainage, and those submitted to postoperative abdominal drainage.

SUMMARY AND CONCLUSIONS

1. Ectopic pregnancy occurred in the City Hospital of Akron 100 times in the five-year period from 1931 to 1936.
2. Fainting, dizziness, or weakness was recorded 58 times; in 11 these symptoms were not mentioned.
3. Missed or delayed periods usually with subsequent spotting occurred 74 times.
4. Pain, either "knifelike" or "sticky," was complained of in 90 patients.
5. Of the 90 pelvic examinations recorded 89 presented adnexal masses which proved to be ectopic tubal pregnancies at operation.
6. Cul-de-sac puncture as a diagnostic method was done 4 times. Colpotomy with "T" tube drainage was instituted twice with adverse results.
7. The white, differential blood count, and hemoglobin determination were given in 89 cases.
8. The Friedman test was used infrequently.
9. Whole blood transfusions were used 12 times and the average amount was 500 c.c. Autotransfusion was used 22 times with an average of 1,700 c.c. in each instance.
10. One hundred patients were operated upon with a mortality rate of 5 per cent and the causes of death are given.
11. Early diagnosis and conservative operations are urged. In 43 cases the ovary was removed along with the affected tube. This number of extirpated ovaries is considered unnecessarily high.
12. Abdominal drainage was used in 3 cases. The reason was not given.
13. Unwarranted additional surgery apparently contributed to the mortality.
14. Abstracts of the case histories of the 5 patients who died are presented.
15. The average postoperative stay in the hospital in the group which recovered was found to be slightly greater than nine days.

I wish to express my appreciation to Dr. Charles C. Pinkerton for many valuable suggestions in the preparation of this report and also to thank the Surgical Staff of the City Hospital of Akron for their permission to publish the cases herein reported.

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WHEAT GERM OIL THERAPY

II. PRESERVATION OF POTENCY, INFLUENCE ON LABOR, SEASONAL NEEDS

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PRESERVATION OF POTENCY

WHAT are the conditions which govern the preservation of potency of a wheat germ oil preparation? Is potency retained more effectively in bulk or in capsule form? Have extremes of temperature any influence on it, and if so, what? Gradually some opportunities have presented themselves by which an estimate of these factors has been reached.

Not infrequently patients both in the clinic and in private practice had their complaints controlled by means of wheat germ oil. That is to say, their symptoms and signs of threatened abortion or threatened abruptio placentae, for example, had disappeared. When next seen these patients sometimes displayed the same symptoms and signs for which the wheat germ oil had been administered, although they had followed directions carefully and taken their oil regularly in what had hitherto proved to be an adequate dosage. This was noticed by us especially during the winter months, and on inquiry we usually found that these women had neglected to keep the oil cold. They had left the oil at room temperature for days, in rooms which were often very warm. When fresh samples of the oil were given to them, the original regime proved quite as effective as at first, and they were promptly and permanently brought under control again. Accordingly we warn every patient nowadays to keep her oil in the refrigerator or some other cool place, and, indeed, insist that local druggists adopt the same precautions. All this in spite of Evans¹ original observation on the resistance of vitamin E to high degrees of heat.

The case histories of a few patients will illustrate the duration of the potency of oil kept under optimal conditions.

A patient whose first pregnancy had ended in a stillbirth due to abruptio placentae, came under observation at the fourth month of her second pregnancy. The last menstruation had begun on May 18, 1935. On June 15, she first noticed some edema of the extremities. On September 14, a severe low backache began and continued for seven days. At the same time some intermittent uterine cramps were felt and she felt nauseated and miserable. On September 17, her blood serum was anti-proteolytic² and she was given wheat germ oil in bulk, four drams at each dose three times within the first twenty-four hours, then one dram each day. On September 18, there were intermittent low back pains for several hours. On September 21 and 23, there were small uterine hemorrhages of bright red blood, accompanied by intermittent back pains and uterine contractions. There was no elevation of blood pres-

sure nor albuminuria, but there was definite tenderness of the fundus uteri. The blood serum remained definitely antiproteolytic. As there had been no improvement on the oil therapy, an inquiry was made as to the preservation of the batch which was being used. We found that the patient had been given the dregs of a Winchester of the oil received in June, 1935, which, however, was not noticeably rancid. A new supply of the oil was prepared and given until term by the same routine as before. There was a prompt subsidence of hemorrhage, uterine and low back pains, fundus tenderness. When an opportunity to test the blood again presented itself on October 10, the serum had reverted to normal. It remained so on occasional tests until the delivery at term of a normal female child weighing six pounds seven ounces.

Another patient was given the same wheat germ oil sample as had been used in the last case described, because of symptoms and signs of a threatened premature delivery, on June 25, 1935. All her symptoms were controlled and her blood serum reconverted to normal digestibility until July 20. When next seen, on August 8, her previously normal blood pressure had risen to 142/84, fundus tenderness and albuminuria had developed. At the time of delivery of a normal eight-pound male child on August 18, her serum had again become antiproteolytic, although she had taken her oil faithfully in a dosage which had proved adequate until August. We have done over 2,400 tests on blood sera for the antiproteolytic estrogenic factor and have never yet found a patient's blood serum antiproteolytic after she had received an adequate dose of a fresh preparation of a potent wheat germ oil.

Four patients, of whom one had had one previous spontaneous abortion, and another two previous miscarriages, but none of whom had borne living children, were almost simultaneously put upon wheat germ oil capsule therapy in the early part of November, 1935. The oil used had been prepared on Oct. 21, 1935. Simultaneously about Christmas time all four patients began to exhibit evidences of escape from the influence of the oil. The blood of three of the four had become antiproteolytic for the first time since therapy had been begun. The blood of the fourth could not be secured for testing. One patient developed a Couvelaire apoplexy of the lower segment of the uterus. Enormous doses (30 per day) of the same wheat germ oil capsules that she had been using for months could not control her uterine tenderness and rigidity, nor render her blood normally digestible, and a cesarean section was finally performed after doses of fresh bulk oil had accomplished with their accustomed promptness all the old capsules had failed to do. The diagnosis of uterine apoplexy was strikingly confirmed at operation. Fortunately, the child survived its difficult experience. Another of these patients suddenly developed continuous uterine pain and fundus tenderness, bled from the uterus, and her blood simultaneously became antiproteolytic. Fresh bulk oil corrected all this promptly, as usual. The third patient had twice miscarried at six and a half months and at this Christmas season was only three months pregnant. She developed no evidences of abortion, but a general malaise and some attacks of dizziness. Her blood had also become antiproteolytic. Fresh bulk wheat germ oil promptly rendered her blood serum normally digestible and corrected her symptoms. By means of the continued use of fresh bulk oil, regularly checked by blood tests for the recurrence of the antiproteolytic factor in the blood, she went to term and delivered a normal baby. As she was a marked hypothyroid, however, she required as much as six drams of the oil each day toward term. The symptoms of the fourth patient, uterine tenderness and sudden gain of seven pounds of weight (her blood could not be tested), were also promptly corrected by the administration of fresh bulk wheat germ oil.

Unfortunately we have had no opportunities to check these observations on the preservation of potency of wheat germ oil on rats. What

conclusions we have reached are based entirely upon purely clinical work. However, on the basis of experience with the cases described in detail above, and many more recent cases, we have come to believe that wheat germ oil, whether in bulk or in capsules, retains reliable potency very little longer than eight weeks. Indeed, if kept at room temperature we believe its potency may be lost in a very few days. We have made no effort to find preservatives for the oil.*

We hope that other workers will investigate this important question of the preservation of potency in more detail, with animals. Until the point is settled, many preparations of wheat germ oil being marketed must lie under some degree of suspicion.

INFLUENCE ON LABOR

Many of our patients who took wheat germ oil throughout the greater part of their pregnancies were so much impressed by its ability to prevent the premature occurrence of labor, that they hesitated to use it at or near term. They feared it would carry them beyond term. However, there appears to be no basis for such apprehension. It has been the author's practice to insist upon the use of the oil up to the very onset of spontaneous labor, because he feared the late development of abruptio placentae^{3, 4} if it were stopped prematurely. He has never observed that the onset of labor was unduly delayed in this way in the 60 cases in which it has been used continuously until labor began.

Moreover, we have repeatedly seen threatened or partial abruptio placentae occur at or near term in women who have never received wheat germ oil. In these cases we have felt that a preliminary preparation of the patient with oil before the indicated induction of labor would be helpful. When this was carried out, by the use of the usual massive dose of 12 drams of wheat germ oil given one day before the medical induction, the induction has been as successful as could have been expected had no oil been given, and the labor has proceeded as usual.

To demonstrate this even more clearly, we have recently attempted to stop labor early in the first stage in a small number of cases by means of the usual massive dose of wheat germ oil. Some of these patients were nauseated, as could be anticipated, and found our procedure very trying. However, in no case of the 10 cases attempted, did we detect any tendency for the labor to stop or be prolonged unduly.

*Recently Palmer (*Industrial and Engineering Chemistry* 9: 427, 1937) has reported rat assays on oil sealed in vacuo and kept cold for months. The residual potency displayed wide variations, but most of the samples were quite active for at least eight months. I believe, however, that a more sensitive test of E potency than the classical rat assay is the clinical response of a very common type of pregnant human patient, one having an incipient toxemia of the kind which frequently terminates in premature placental detachment. Most of these women have enough E to carry the fetus to term, but they do not have enough to prevent the appearance of toxemia of this particular sort. Wheat germ oil suitable for use in human pregnancy should do more than preserve pregnancy in the rat or in the human being; it should protect the latter from this toxemia.

Moreover, many women were tested just after or during normal parturition at term by our blood test for the antiproteolytic factor described by us. No more than the usual 10 per cent² of these normals displayed the presence of such an estrogenic^{5, 6} factor in their sera. This observation, of course, seems difficult to reconcile with the observations made on increased urinary estrin output just before labor by Marrian and his coworkers.⁷ However, blood estrin and urinary estrin values may differ very greatly.⁸⁻¹⁰ Moreover, the Smiths¹² have very recently indicated that before the onset of labor or during labor in normal women, serum estrin may show no increase or even may fall. They also show that the level reached in these normal sera at labor does not exceed 1 rat unit per c.c. of serum, whereas our test for estrogenic substance will not disclose a content of less than 2.5 rat units per c.c. of serum.

It would appear, therefore, that the onset of labor at term is determined by several factors, of which the presence of an increase of blood estrogenic substance is only one, and by no means an essential nor invariable prerequisite. As vitamin E appears to act principally by neutralizing any excess of estrogenic substance in the bodily economy, there would a priori be no obvious reason why it should interfere with the onset or course of labor at term, and it does not do so. There is undoubtedly much more involved in the physiologic onset of labor at term than just the balance between vitamin E and estrogenic substance in the body.

In March, 1937, a patient two months pregnant was seen who had no evidence of impending abortion. A blood serum tested routinely revealed no excess of estrogenic antiproteolytic substance. However, three days later a spontaneous abortion began and proceeded slowly to its termination quite unaffected, as far as could be seen, by the administration of 12 drams of wheat germ oil, known to be potent, which were given each day for six days. We took this to be one of the small percentage of cases of spontaneous abortion not due to vitamin E deficiency, and therefore not affected by wheat germ oil therapy. Its interest in this discussion is that it indicates that wheat germ oil has no influence in stopping labor, even long before term, where that labor is not induced by a deficiency of E and concomitant excess of blood estrogenic substance. The decidua came away intact, and suggested very definitely that it had been located as a central placenta previa.

SEASONAL NEEDS IN WHEAT GERM OIL THERAPY

It is obvious that there should be a good deal more available vitamin E in the green diets of summer and early autumn in this latitude and country. For four consecutive years during the progress of this study, we have observed a very definite seasonal rhythm in the incidence of premature interruption of pregnancy, and in abruptio placentae and the conception of deformed fetuses in particular. All of these phenomena appear to have some relation to deficiency of vitamin E in our experi-

ence. All of these pathologic conditions appeared more frequently from January to June each year and more infrequently from July to December.

Moreover, it has been our annual experience that larger doses of wheat germ oil were required by women with precarious pregnancies in the months from January to June each year. In many instances the dose was tripled. In our experiments on rats it has taken us from two to four months, and usually the latter, to render the animals sufficiently defective in vitamin E to cause spontaneous resorption of their fetuses. If the E deficiency in the diet were less marked we would have an approximate analogy to the observations we have made on human females. For the latter from November onward eat progressively less green food and drink milk whose origin is further and further removed from green fodder. These women, if pregnant, begin to display from February until June an increasing tendency to terminate their pregnancies prematurely.

Moreover, as would be expected, human males are not exempted from the seasonal tides of available vitamin E.

The author tested a number of unselected normal male medical students in the months of April and May, and also in the months of October and November, during 1936. It was found that 70 per cent of 36 such males tested in April and May revealed excess of estrogenic antiproteolytic substance in their blood sera. But in October and November only 50 per cent of 28 such males gave the corresponding result. That this last figure is so high is due, perhaps, to the very arid summer of 1936 and the resulting poor quality of green food available to these men in the months just prior to the time of testing their sera. These results may be compared with those of Frank and Goldberger,¹³ presumably secured not long prior to March, 1928, in New York City. They found that 7 or 15 per cent of 47 males whom they assayed gave a positive test for the presence of estrin in the blood by their biologic assay method. We have illustrated the inverse relationship of vitamin E and estrogenic substance in the body elsewhere.¹⁴

What importance such an observation has for the problem of male sterility remains to be seen. It has been shown¹ that male rats rendered deficient in vitamin E develop a testicular degeneration, which is probably irreversible, and that after five months sterility ensues.¹⁵ Moench¹⁶ has recently mentioned the use of vitamin E as a curative measure for sterility in the human male. One case of male impotence with gross testis atrophy which the author has seen has had return to potency and marked testis growth on vitamin E therapy.

SUMMARY

1. Wheat germ oil should be kept cold to prevent deterioration.
2. Wheat germ oil, in bulk or in capsules, retains reliable potency very little longer than eight weeks, even when so kept.

3. The administration of wheat germ oil up to term does not delay the onset of labor nor prolong the duration of labor.

4. Green foods, such as lettuce and water cress, do not replace wheat germ oil in the treatment of the pregnancy complications related to deficiency of vitamin E in the human being. Milk may be an important factor in the diet as concerns its content of vitamin E.

5. Human males show a seasonal variation in the estrogenic substance in their blood, and hence in their assimilated vitamin E. This may have some bearing on male sterility.

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DIETARY HABITS DURING PREGNANCY*

WITH SPECIAL REFERENCE TO THE VALUE OF QUALITATIVE FOOD RECORDS

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FOR a number of years we have been using two different methods for determining or estimating the ingestion levels of various food elements of our research subjects. The methods were employed as a part of our study of pregnant women and the factors which might influence the growth and development of the human fetus. Since one of these methods consisted of the quantitative analysis of food aliquots, and the other of estimates based on qualitative records, and since the two methods were, in a number of instances, applied to the same patients, we have an opportunity to test the usefulness of the "qualitative" method by comparing its results with those obtained with conventional quantitative chemical analyses.

Because nutrition is one factor which influences vitally the status of both mother and child, we wished to extend the scope of our study to include a greater number of our subjects than could be included by

*Data for this paper have been collected at the Fels Research Institute by Miss Idell Pyle, Dr. Amy Hunter, Dr. Geneva Shong, and Miss Martha Potgieter.

actual chemical work. We have attempted in this study to determine the value, if any, and the limitations of, a qualitative nutrition method as it was applied to our research material. Some of the dietary habits of 25 pregnant women of moderate to meager means are also considered in this paper. Their husbands were employed as follows: 8 engaged in small business, 7 college teachers, 4 farmers, 1 laborer, and 5 were not married.

RECORDING AND ANALYSIS OF QUALITATIVE FOOD DATA

In the "qualitative" method used, the patients were given mimeographed sheets on which there were spaces for recording each of the three meals of the day by items, the estimated quantities of some, but in most instances the number of servings. Thus for breakfast a mother might make a record something like the following: orange juice, $\frac{1}{2}$ glass; oatmeal, 1 serving with cream and sugar; white bread toast, 1 slice with butter; coffee, 1 cup with cream and sugar. Lunch and dinner would be recorded in a similar manner, as would also any

TABLE I. SIZE OF SERVINGS OBTAINED FROM QUANTITATIVE DATA

FOOD GROUP	AVERAGE SIZE OF SERVINGS OF FIFTEEN INDIVIDUALS*			AVERAGE BASED ON AVERAGE SERVINGS OF EACH OF THE FIFTEEN INDIVIDUALS	
	NUMBER OF SERVINGS	AVERAGE WEIGHT OF SERVINGS†	COEFFICIENT OF VARIATION	WEIGHT OF SERVINGS	COEFFICIENT OF VARIATION
Meat	111	68.9	44.8	71.3	26.6
Sea food	27	104.3	36.5	113.3	32.3
Milk	302	233.1	54.7	254.8	38.1
Ice cream	21	91.8	18.2		
Cheese	29	23.1			
Eggs	72	61.7	41.3	60.5	41.2
Legumes and nuts	40	82.1	66.3	91.5	53.8
Potatoes	70	93.4	53.7	95.0	33.5
Cooked leafy vegetables	21	116.8	45.0	116.3	27.7
Other cooked vegetables	53	67.2	64.0	65.2	69.4
Raw leafy vegetables	101	44.2	58.1	38.8	44.1
Other raw vegetables	48	48.9	61.1	39.5	40.7
Tomatoes	93	148.9	55.1	141.9	30.5
Citrus fruits	113	117.9	54.7	124.0	22.8
Other raw fruits	134	129.5	60.2	122.2	34.2
Cooked fruits	89	123.7	82.8	109.5	30.4
White bread	112	43.8	53.9	37.1	29.6
Whole grain bread	94	43.2	47.9	47.7	36.4
Other flour and meal mixtures	112	44.3	77.6	38.3	71.0
Milled cereals	24	32.8			
Whole grain cereals	70	35.8	97.7	40.6	74.5
Sweets	227	20.8	96.3	17.9	53.2
Butter	232	13.9	72.4	13.8	34.1
Cream	83	63.0	68.2	62.5	24.0
Bacon	50	19.6			

*These 15 individuals include the 5 considered in Table II.

†Our data were adjusted to the figures in this column. The average was obtained by adding all of the serving weights and dividing by the number of servings. In column 4 an average was first obtained for each individual.

between-meal lunching. This type of record was kept for each day except in those instances in which travel, illness, or other emergency made record-keeping inconvenient. The subjects were impressed with the fact that we wished to have records filled out day by day. If, in any instance, this could not be done on the same day the food was eaten the record was to be skipped with the attitude that no feeling of guilt should result from the failure to record the day's menu.

When the records were complete the diets were tabulated. For this purpose a list was prepared on which all foods that had been eaten were classified into groups. These groups appear on Fig. 1 and in Table I. We went through the diet for each day, counted the number of times foods of each group appeared on the menu and recorded the

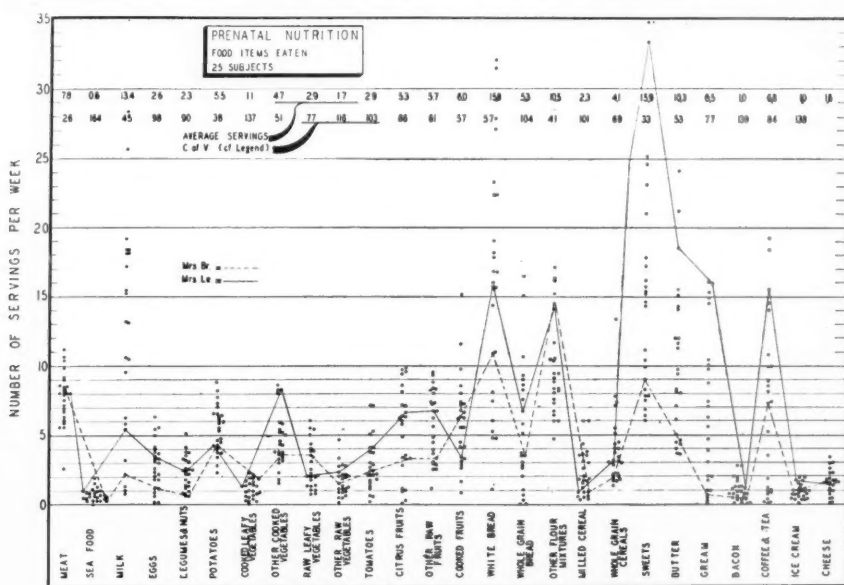


Fig. 1.—The points on the figure represent the number of servings per week for the several food groups which are indicated on the lower part of the figure. The scores for Mrs. Br. and Mrs. Le. have been followed through. The numbers in the upper quartile of the figure give the averages for the 25 women, and the average (25 women) for the coefficient of variation for the average number of servings per week. These coefficients indicate the extent of variation from one week to another.

number in the proper space of a tabulation sheet on which there was mimeographed a list of the food groups and spaces for recording the daily use, by number of servings, of these foods. When there was doubt as to which food group an item belonged, an extensive list, which had been prepared previously, served as authority.

The total period over which the diet was kept was divided into seven-day weeks starting at the delivery week and working back. For weeks having not more than two days missing, a seven-day total was computed on the basis of figures available. When more than two days were missing, the entire week was omitted. Next the weekly average

number of servings of a food group was determined. The results of such tabulations are shown graphically in Fig. 1. Each point represents the average number of servings of a food group an individual had per week. It can be seen that the dietary habits of these 25 differed considerably, and when the scores for any particular individual are followed through, as has been done for two cases in Fig. 1, her peculiarities are at once revealed. Each point on Fig. 1 (a) varies with respect to the average of the entire group, and (b) represents an average of the several weekly scores; hence, a coefficient of variation can be computed for each point on Fig. 1.

The values for the average (average for the 25) number of servings of a given food item per week and the average of the above-mentioned coefficients of variation are given on Fig. 1. When all the women ate of a given food class frequently the group average was, of course, high; furthermore, if high averages are associated with low coefficients of variation and low averages with high coefficients of variation, a high group average indicates stability of ingestion of that item and vice versa. The actual correlation between the two items (group average of average number of servings per week and group average of the coefficients of variation of the individual average number of servings per week) was found to be -0.76 ± 0.06 . This gives a coefficient of determination (r^2) equal to 57.8. Hence, 57.8 per cent of the variation in choice of items from one week to another is associated with the number of times that item is eaten. This fact, we believe, has some bearing on the question of changes in diets during pregnancy; because the intake of food items which are taken frequently enough to be important in the nutrition of the patient also tends to remain stable throughout pregnancy.

ESTIMATING THE CHEMICAL COMPOSITION OF THE DIET FROM QUALITATIVE FOOD RECORDS

We have compared the results obtained from an analysis of the qualitative and quantitative data in order to show (1) within what limits quantity of ingestion of a given food element can be estimated from the qualitative records, and (2) whether the estimated quantities obtained from the qualitative records bear a fairly constant relationship to the actual ingestion, and, therefore, can be used for the relative rating of individuals.

In order to transform qualitative food records into estimates of the quantities of food elements, it is necessary (1) to group foods according to the likeness of their chemical composition, (2) to determine the average number of servings per time unit in each of these groups, (3) to determine what quantity of each food group most nearly represents the size of each serving, and (4) to employ tables of the average chemical composition of the various food groups. Of these procedures,

only (2) is free from obvious gross error as a result of the inaccuracy of attempting to classify food mixtures, the variability in the size of servings, and the variability in chemical composition of any given food. It is, of course, necessary to determine what error may be expected from these sources. To accomplish this objective we have compared the results of our qualitative determinations with quantitative determinations on the same subjects.

The chemical composition assigned to the food classes was based on the figures given in Waller's food table.* In the case of milk, ice cream, eggs, and other single items, the actual analysis, given as such, was used; but in such instances as cooked leafy vegetables an average was taken of the composition of a number of foods which are included in our classification of cooked leafy vegetables. In order to have a table with a uniform base for conversion purposes, a 100-gm. portion was chosen as the basic quantity.

The figures for the probable size of the serving were based on quantitative records of 15 women who have been used in balance studies in our laboratories. These records were analyzed and an average was taken of the actual weight of the servings. These average figures are given in Table II along with the number of weighings on which they are based and the coefficient of variation. As might be anticipated, the variation in size of serving was considerable. If, as we have done, the weight of the serving is computed from the group score as a whole and also from the 15 averages of the 15 individuals, there is good agreement between the two. The variation from one individual to another can also be seen from Table II.

TABLE II. COMPARISON OF QUANTITATIVE AND QUALITATIVE DIETS

SUBJECT	NUMBER OF OBSERVA- TIONS*	CALCIUM GM.	PHOSPHORUS GM.	PROTEIN GM.	FAT GM.
Mrs. L.	6	1.18 (1.50)†	1.57 (1.65)	79.0 (94.1)	106.1 (86.4)
Mrs. B.	7	1.21 (1.47)	1.50 (1.29)	70.5 (64.7)	94.3 (106.2)
Mrs. Pi.	8	1.01 (1.54)	1.29 (1.54)	67.7 (81.0)	87.8 (96.5)
Mrs. W.	3	1.22 (1.59)	1.38 (1.51)	68.1 (64.5)	none
Mrs. Pr.	6	1.82 (2.39)	2.16 (2.39)	110.0 (112.2)	none
The above com- bined	30	1.27 (1.69) $r = +0.70 \pm 0.06$	1.58 (1.67) $r = +0.73 \pm 0.06$	79.9 (83.7) $r = +0.80 \pm 0.04$	94.7 (94.7)‡ $r = +0.43 \pm 0.12$

*These observations were at approximately twenty-eight-day intervals.

†The figures in parentheses are those from actual quantitative analyses, some of which have been published elsewhere (Pyle and Huff).¹

‡Twenty-one cases.

With these figures available it is necessary to multiply the average number of servings of a food group per week by the average size of

*In order that there may be no misapprehension, it is pointed out that the qualitative method is adjusted to the records of 15 women; 5 of these are chosen for actual comparisons. If all 15 could have been used for actual comparison, the result would simply have amounted to a check on the figures for chemical composition of the food classes. In the present comparison, the 5 contribute to the estimate for the size of serving, and one would naturally expect that the size of their servings would be better adjusted than those of any random sample would be. This fact loses much of its significance when it is considered that the dilution, in every instance, is 1 in 15

the serving of that group; multiply this product, which is the estimated quantity per week of that food group which was eaten, by the score for that food group (from the tables) for calcium, phosphorus, nitrogen, fat, etc., and divide by 100 (since the score is based on 100-gm. samples). The values for each food element thus determined are then added and the total estimated value for each food element is obtained. Those obtained for calcium, phosphorus, protein, and fat can be seen on Fig. 2. There the scores for two individuals are marked. These are

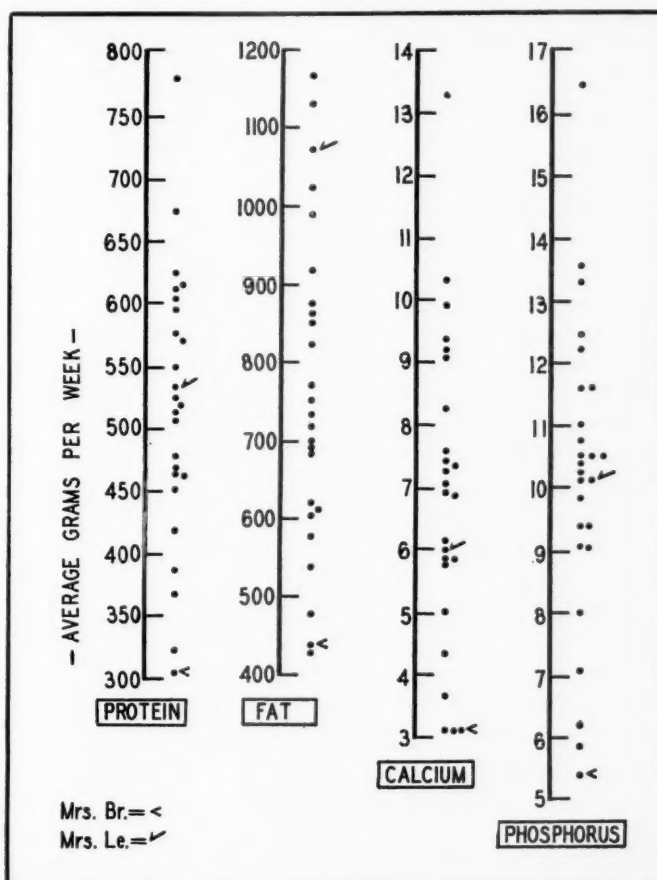


Fig. 2.—The estimated quantity of protein, fat, calcium, and phosphorus ingested per week by 25 women during pregnancy. The scores for Mrs. Br. and Mrs. Le. are indicated.

the same persons whose average number of servings per week have been followed through on Fig. 1. If the records of these two are examined on both figures it is not difficult to see why the habits of one of them (Mrs. Br.), as indicated on Fig. 1, should have resulted in such low intakes of protein, calcium, phosphorus, and fat as our estimates indicate in Fig. 2, since her general level of ingestion is low. The reason for the low calcium score and almost average intake of

phosphorus of the other individual (Mrs. Le.) is also quite apparent. Her intake of meat, eggs, legumes, and nuts is almost average while her milk intake is low. Although there is considerable variation in size of servings, it is our feeling that the existence of a poorly-balanced or well-balanced diet shows up readily in Fig. 1. An actual comparison of qualitative and quantitative scores makes a more complete appraisal possible.

Of the 15 women from whose records Table I was constructed, 5 had qualitative records and at the same time had cooperated in a number of balance studies which have been described by Pyle and Huff.¹ It was, therefore, possible to compare the actual food analyses on the metabolism days with the qualitative estimates for those same days.² A summary of such a comparison is given in Table II. There is fair agreement between the quantitative values and the qualitative scores. The calcium figures are in every instance too low, but the product moment correlation for all 30 observations is as good as that for phosphorus and protein, and better than that for fat, which is based on only 21 observations for 3 subjects.

DISCUSSION

These results would seem to warrant the conclusion that the qualitative method, as it is described above, is adequate for scoring a group of individuals and for comparing any one of the individuals with the group as regards ingestion of the various food elements. Obviously, the method is not applicable as a part of balance study technique. The method should be useful for studying the influence of nutritional factors on a large group of individuals. There is compensation for lack of precision in the fact that nutritional disorders are usually not noticeable until an individual deviates considerably from an optimum intake.

The reason for the low calcium scores is not entirely clear. No doubt there is a tendency for the qualitative method to underrate, but this is probably not the only reason, since one would anticipate an under-rating of all factors to take place simultaneously and not consistently only one of them. A significant part of this discrepancy is probably due to the very high calcium content of the water in this locality.

SUMMARY

The dietary habits of 25 individuals are described and compared. The variation in intake of a given food item or group of food items from one week to another is largely dependent upon the average quantity (number of servings) eaten in a week. It is pointed out that this fact may have some bearing on the question of changes in dietary

habits during pregnancy. A system whereby the quantity of calcium, phosphorus, protein, etc., eaten is estimated from daily qualitative records of the food items eaten by an individual has been described and evidence is given to show that the system is reliable within such limits as are frequently desirable for certain types of group dietary studies.

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A STUDY OF 2,987 CONSECUTIVE EPISIOTOMIES

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AN OPERATIVE procedure which is frequently performed may gradually become ignored as a possible source of complications. This is particularly true if the procedure is undertaken only as a portion of the treatment of the patient. In many respects this is the present attitude toward episiotomy. This study was undertaken in an attempt to evaluate episiotomy from this standpoint. A comparison is also presented between two common methods of repair of episiotomy.

The material upon which this study is based was obtained from a review of the records of all patients delivered in the Chicago Lying-In Hospital from July 1, 1933 to June 30, 1935. During this period there were, 5,624 hospital deliveries. Episiotomy was performed in 2,987 of these deliveries (Table I). The incidence of episiotomy is therefore 52.9 per cent in this series. Slightly less than one-half of the total group of patients were being delivered for the first time. In nearly every instance the episiotomy was performed upon a primipara or upon a patient who had had a previous episiotomy.

Indications.—Episiotomy is usually performed in an attempt to minimize the injury to the birth canal which occurs with the passage of the presenting part and after-coming head over the perineal body. If the outlet is not enlarged by such a procedure, laceration occurs in 50 to 60 per cent of primiparas. Episiotomy becomes increasingly indicated when the perineum has less than the normal elasticity due to such conditions as advancing age, extreme muscularity, perineal scars, or congenital deficiencies. In the presence of a large or firm fetal head the danger of perineal rupture is increased. Contracted pelvis, particularly of the funnel type, necessitates a greater encroachment of the fetus upon the posterior part of the pelvic outlet and increases the frequency of perineal tears. Rapid delivery occurring before adequate dilatation of the soft parts has been accomplished indicates episiotomy

to protect the perineum from serious laceration and also to protect the fetus from sudden increase in intracranial pressure. When episiotomy is indicated it should be performed soon after the presenting part has descended to the pelvic floor rather than when perineal laceration is imminent. This not only preserves the integrity of the pelvic floor but subjects the fetus to a lesser degree of trauma.

Technic.—Mediolateral episiotomy is the type in routine use at the Chicago Lying-In Hospital. The depth of the incision varies, of course, in the individual case but has usually been sufficiently deep to cut the superficial portions of the levator ani muscle. In nearly all instances the repair has been performed at the completion of the third stage of labor.

Two general methods of repair have been employed. In nearly three-fourths of the cases (72.6 per cent) nonabsorbable suture has been used. In this type of repair the edges of the vaginal mucosa are approximated with interrupted catgut suture. The muscle of the perineal body and the skin edges are brought together with deep interrupted, figure-of-eight, silkworm sutures. Usually four to six such sutures are used. They are tied loosely and at the completion of the repair the skin edges are accurately approximated and fixed with Allis clamps which are left in place for ten to fifteen minutes. This is the type of repair which the internes are instructed to use and which is routinely performed for teaching purposes.

TABLE I. CHICAGO LYING-IN HOSPITAL, JULY 1, 1933, TO JUNE 30, 1935

Total No. deliveries	5,624		
With episiotomy	2,987	52.9%	
Without episiotomy	2,637	47.1%	
<i>Episiotomy</i>			
	TOTAL	INFECTED	PER CENT
Silkworm-gut repairs	2,170	56	2.5
Catgut repairs	817	11	1.3

In the other method catgut is the primary suture material used. Either continuous or interrupted sutures are used to approximate the muscle and subcutaneous tissue. The vaginal mucosa is closed with catgut and the skin edge with either catgut or a subcuticular silkworm suture.

During the delivery particular attention is paid to hemorrhage from the episiotomy wound. This is usually controlled satisfactorily by the pressure of a sponge in the incision. Bleeding vessels are clamped and tied prior to delivery. During the repair any bleeding points are carefully ligated. The amount of blood loss may be considerable and hemorrhage is one of the dangers of episiotomy, difficult perhaps to evaluate but of undoubted importance.

Care of the perineum during the puerperium has been the same in the two types of repair. It consisted of perineal irrigations following voiding or defecation. Heat has been applied in the form of saline packs when discomfort is present. Careful inspection of the perineum is routine when any abnormality is suggested. The silkworm sutures are removed on the eighth postpartum day except when earlier removal may be indicated for drainage.

Immediate Results.—Healing of the episiotomy incision takes place with equal rapidity in the two groups. In the absence of infection there is no apparent difference in the amount of discomfort. Pulling of the sutures may occur in either group and the amount of soreness present depends to a considerable degree upon the tension used in tying the sutures. Ample room should be allowed for the edema which usually develops. Care should be exercised in tying the silkworm sutures so that the cut ends will not prick the skin surface.

Infection of the episiotomy wound was present in 67 patients of the total group. The incidence of infection is therefore 2.2 per cent. The incidence is slightly higher in those repaired with silkworm suture. In the 2,170 patients repaired in this manner 2.5 per cent (56) showed infection. In the catgut repair series 11 of the 817 patients (1.3 per cent) had infection in the wound (Table I). Many of the infections were of minor character as is evidenced by their relation to febrile morbidity. Interesting in this connection is the fact that in the silkworm group only one-half of the infected patients had sufficient elevation of temperature to be considered as morbid (Table II). In the catgut group, however, 9 of the 11 patients with infec-

TABLE II. MORBIDITY

	TOTAL	TOTAL NUMBER MORBID	PER CENT	MORBIDITY DUE TO EPISIOTOMY
Silkworm gut	2,170	278	12.8	28
Catgut	817	113	13.8	9

Follow-Up

	TOTAL	GOOD		FAIR		POOR		NO RECORD	
		NO.	%	NO.	%	NO.	%	NO.	%
Silkworm gut	2,170	1,006	46.3	375	17.2	49	2.2	740	34.1
Catgut	817	336	44.8	49	5.9	9	1.1	393	48.1

tion were classed as morbid. It would appear that infection in the latter group was more extensive or that it was not as readily recognized so that early drainage could be established.

The incidence of infection shows, as would be expected, a correlation with the type of procedure used to complete delivery (Table III). Approximately one-half

TABLE III. OPERATIVE PROCEDURES

	TOTAL	SILKWORM-GUT			CATGUT		
		TOTAL	IN- FECTED	PER CENT	TOTAL	IN- FECTED	PER CENT
Spontaneous delivery	1,631	1,233	25	2.02	398	1	0.25
Low forceps delivery	1,029	687	14	2.03	342	8	2.31
Midplane forceps	184	136	10	7.3	48	-	-
Midplane forceps with Dührssen's incisions	32	27	-	-	5	-	-
Breech extraction or for- ceps on after-coming head	75	63	5	7.9	12	-	-
Twins with interference	9	8	-	-	1	-	-
High forceps	10	5	1	20.0	5	2	40.0
High forceps with Dührssen's incisions	11	9	-	-	2	-	-
Version and extraction	5	2	1	50.0	3	-	-
Craniotomy	1	-	-	-	1	-	-
Total	2,987	2,170	56		817	11	

of the episiotomies preceded natural delivery. The incidence of infection is lowest in this group and increases with the complexity of the obstetric procedure performed. It is to be noted that comparable numbers of the various operative procedures were done in the groups with the two types of repair. The incidence of low forceps deliveries was 31.6 per cent in the silkworm group and 40.8 per cent in the catgut group, while in midplane forceps, the figure was 6.2 per cent and 5.8 per cent, respectively. The other operative procedures show a similar parallel so that this is not a significant factor in the evaluation of the two methods of repair.

TABLE IV. TOTAL MORBIDITY

TYPE OF DELIVERY	NO. OF CASES	UPPER GENITAL TRACT INFECTION	INFECTED PERINEUM	FEMORAL THROMBO-PHLEBITIS	UPPER RESPIRATORY INFECTION	URINARY TRACT INFECTION	MASTITIS	UNDETERMINED	MISCELLANEOUS	TOTAL MORBIDITY	PER CENT
Spontaneous	1,631	48	10	1	6	4	4	94	1 (Appendix)	168	10.3
Low forceps	1,029	34	17		14	3	3	65	1 (Anemia)	138	12.4
Midplane forceps with	184	8	6	2	1	2	1	16	1 (Tuberculosis)	37	20.1
Midplane forceps with	32	7	3		1			3	1 (Eclampsia)	14	43.7
Dührssen's incisions											
Breech extraction or forceps on aftercoming head	75	3			1						
Twins with interference	9	1						9		13	17.3
High forceps	10	3						2		3	33.3
High forceps with								3		6	60.0
Dührssen's incisions	11	4	1					4		9	81.8
Version and extraction	5	1							1 (Tuberculosis)	2	40.0
Craniotomy	1							1		1	100.0
Total	2,987	109	37	3	23	9	8	197	5	391	13.1

Morbidity.—The factors responsible for morbidity in the total group of 2,987 are recorded in Table IV. The standard of morbidity used is that suggested by DeLee. Every patient with a temperature of 100° F. at any time throughout the hospital stay is considered morbid. The morbidity rate for the 2,987 patients is 13.1 per cent using this standard. If classified according to the Strassburg method (any patient having a temperature of 100.4° F. on two days of the second to tenth puerperal days inclusive), the morbidity rate is lowered to 6.7 per cent. In Table IV the causes of morbidity and their frequency in the various obstetric procedures employed in the group are summarized. It is to be noted that infection of the episiotomy wound, although relatively infrequent, forms the second largest group of specific causes of morbidity. It is exceeded in frequency only by upper genital tract infection.

Morbidity may be considered by other standards than temperature elevation. An increase in the average duration of hospitalization should be classed as evidence of morbidity. The usual duration of hospital stay for our patients is ten days. In the group of patients in whom an infected episiotomy was present the period of hospitalization was somewhat longer. The average duration in the cases repaired with the silkworm gut technique, in which infection of the wound developed, was 12.5 days. In the patients in whom infection was present in an episiotomy wound repaired with the catgut suture technique the average duration of hospitalization was prolonged to 15.3 days.

Mortality.—In the complete series of 5,624 delivered during the period of our study there were 12 deaths. This results in a mortality rate of 21.3 per 10,000 patients. Only three of these deaths occurred in the 2,987 patients upon whom episiotomy was performed. In these three instances there is no demonstrable relation between the episiotomy and the fatal termination. In one of the patients pregnancy was complicated by severe mitral cardiac disease. She was delivered at term by episiotomy and low forceps operation. Death occurred one and one-half hours postpartum of cardiac decompensation. In the second case delivery at term was accomplished also by episiotomy and low forceps application. Death occurred six days postpartum of agranulocytic angina. The episiotomy was repaired with catgut suture and it showed no evidence of infection. The third patient was delivered following episiotomy and midplane forceps application. She died sixty-one days postpartum of puerperal sepsis. The episiotomy was repaired with silkworm suture and was infected. The perineal infection appeared to be secondary to an intrauterine infection with a profuse lochial discharge from which hemolytic streptococci were cultured.

End-Results.—An attempt was made to determine the character of perineal support following episiotomy as evidenced by the condition at the time of examination at least six weeks postpartum. Information was available in the records of 62.1 per cent of the total group with a slightly higher incidence of follow-up in the silkworm gut repair group than in those repaired with catgut. Table II shows a classification of results in the two types of repair. It is to be noted that a poor result was recorded in 2.2 per cent of the silkworm repair group and in 1.1 per cent of the catgut suture repairs. No significant difference in the end-results of the two groups could be noted and generally satisfactory results were recorded. Occasional instances were recorded in both groups in which over-approximation of the incision had been produced. This error is a source of dyspareunia which may not be relieved until the vaginal opening is enlarged by superficial incision. It is to be differentiated from pain due to tenderness along the line of the episiotomy tear. Such tenderness may persist for several months and then gradually disappear.

SUMMARY

Two thousand nine hundred and eighty-seven consecutive episiotomies have been considered from the standpoint of immediate healing, coinci-

dent morbidity, incidence of infection, and end-results. We believe that a sufficiently large series has been summarized to eliminate the majority of errors which might be due to individual factors. The following conclusions are presented:

1. Infection of the episiotomy wound is a minor but significant cause of puerperal morbidity.
2. The incidence of infection is greater in those cases repaired with silkworm gut suture but the average infection in this group is less severe.
3. The incidence of infection in both types of repair increases rapidly with the complexity of associated obstetric procedures.
4. Morbidity and end results depend upon factors other than the type of suture material used in the repair.

FACTORS AFFECTING BLOOD LOSS IN THE THIRD STAGE OF LABOR*

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THE problem of blood loss in the third stage of labor has been subject to extensive statistical treatment in four different investigations, first by Ahfeld¹ in 1904, next by Calkins, Litzenberg, and Plass in 1929² and 1931³ and more recently by Pastore⁴ and the present writers.

These researches have much in common, inasmuch as they all utilize large numbers of cases. Pastore's series is the only one numbering less than 1,000 cases. They all consider the effects of such factors as gravidity, age of the mother, duration of labor, weight of the fetus, and weight and area of the placenta, and they note further the influence of the management of the third stage on blood loss.

Ahfeld and Pastore conclude that certain of the factors named have a marked influence on blood loss, whereas our work and that of Calkins indicate that, while such factors as weight of the mother, weight of the child, and weight and area of the placenta are significantly related to blood loss, the extent of the relationship is too small to be of any predictive value in individual cases.

The secret of the discrepancy lies in the statistical method used. Ahfeld and Pastore relied on a comparison of averages while the other

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studies used the correlation* technique. Comparison of averages may magnify the relationship, since it does not take into account the amount of overlapping between groups. If the number of cases is large, a very small correlation will account for consistent difference in averages. The correlation method takes account of the variability and gives the amount of the relationship in a single figure.

For example, consider Table I taken from Pastore, showing the relationship between age and blood loss in the placental stage.

TABLE I. AGE OF MOTHER AND BLOOD LOSS (FROM PASTORE)

AGE	NUMBER OF CASES	AVERAGE BLOOD LOSS
Less than 20	33	183 c.e.
20-29	337	220 c.e.
30-34	79	266 c.e.
Over 34	51	279 c.e.

Since the average blood loss increases consistently with age, Pastore concludes that there is a significant relationship, that is, that older women lose more blood than younger women. As a matter of fact, if a scattergram were made with age as one axis and blood loss as the other, and points plotted indicating the age and the blood loss for each woman, they would be so scattered that they would show no definite trend. Calkins and the present writers all find correlations of 0.01 or 0.02 for these variables, and if Pastore's data are assumed to have the same variability as ours, a correlation biserial r^{\dagger} of 0.15 is obtained, which might result by chance from a truly zero relationship.

Since Ahfeld's work was done before the correlation technique was known, he is justified in not using it. Ahfeld noted the effect of gravidity, weight of the child, weight and surface area of the placenta, and length of labor on blood loss. He found a greater blood loss to be associated with a heavier child, a larger placenta, or a longer labor. In his management of the third stage, unless the patient had a hemorrhage, he usually did not attempt placental expression until two hours had elapsed.

Williams,⁵ in 1919, criticized Ahfeld's technique of management which resulted in an average blood loss of 515 c.e. He reported that his method of expressing the placenta from the vagina by gentle pressure upon the fundus immediately following placental separation, resulted in an average blood loss of only 344 c.e.

*The coefficient of correlation, Pearson's r , is measured by the formula $r = \frac{\sum xy}{\delta_x \delta_y}$ where x is a deviation from the mean value of all the x 's, y is likewise a deviation from its mean, and δ_x and δ_y measures of variability or spread are $\sqrt{\frac{\sum y^2}{N}}$ and $\sqrt{\frac{\sum x^2}{N}}$, respectively. r is -1 if x and y have a perfect inverse relationship, +1 if x and y have a perfect positive relationship, and 0 if the association between x and y is what would be expected by chance.

\dagger Biserial r is used as a measure of correlation if one variable, such as blood loss, is in quantitative form, but the other is divided into two categories, such as age under thirty and age over thirty. Biserial $r = \frac{M_1 - M_2}{\sigma} \frac{pq}{z}$ where M_1 and M_2 are the means for the two categories, p and q are the percentage in each, and z is the ordinate of the normal curve at the point p . σ is the standard deviation as previously defined.

Using a modification of Williams' technique, Calkins in 1929 was able to reduce the average blood loss to 222 c.c. Calkins, Litzenberg, and Plass, were also interested in factors other than management affecting blood loss in the third stage, and they are the authors of an interesting paper on the subject. Calkin's contribution is based on 1,400 University hospital cases, Plass's on 1,200 private patients, and Litzenberg's on 3,000 University hospital cases.

Using both the comparison of averages and the correlation method, they found that the age of the mother bore no relation to blood loss, but that, due to lacerations, a first pregnancy resulted in slightly greater blood loss than subsequent pregnancies. The length of the third stage of labor was more closely related to blood loss ($r = 0.14$) than the first or second stage ($r = \text{about } 0.05$). Such factors as height and weight of the child and the mother and weight and area of the placenta seemed to have more effect on blood loss since their correlation ranged from 0.09 to 0.18. The management of the third stage was probably more important than any of the other factors, one investigator reporting an average loss of 462 c.c., whereas the other two found average losses of 317 and 222 c.c.

Pastore's study reports an average blood loss of 244 c.c. which compares favorably with the Calkins figure, but Pastore is also to be criticized for not using the correlation technique. His method, the comparison of averages, is the same as that of Ahfeld, done thirty-two years before and his series of cases is not nearly as large. He does, however, include such additional factors as the effect of time of rupture of the membranes, type of presentation of the placenta, and degree of laceration on blood loss. He agrees with Calkins in concluding that duration of labor, weight of the baby, and weight of the patient are related to blood loss, but due to his use of averages he overestimates the amount of the relationship. For the same reason, he stresses the relation between blood loss and age which is really insignificant, and although he gives no figures, he states that there is no relation between weight and area of the placenta and blood loss.

The present study is based on an analysis of 1,658 births at the Minneapolis General Hospital not including multiple births, cesarean sections, and certain incomplete records. Premature and operative deliveries are included with the other cases. The statistical constants have been calculated separately for premature infants, i.e., those weighing under 2,800 gm.; normal infants, i.e., those weighing over 2,800 gm.; and for the total group which had an average weight of 3,348 gm. Since the correlations with blood loss are substantially the same for all three divisions, only the figures for the total group will

be considered in detail. Reference to Table II will show the averages, standard deviations and correlations with blood loss for normal infants. Table III gives the corresponding information for the total group.

The average blood loss, as measured by our technique, was 223 c.c. with a standard deviation of 209 c.c., so that about two-thirds of the patients lost between 14 and 432 c.c. of blood.

TABLE II. MEANS AND STANDARD DEVIATIONS FOR VARIOUS FACTORS AND CORRELATIONS WITH BLOOD LOSS FOR NORMAL INFANTS

FACTOR	NUMBER OF CASES	MEAN	STANDARD DEVIATION	R WITH BLOOD LOSS
Blood loss	1,427	230 c.c.	211.3 c.c.	----
Age of mother	1,362	27 yr.	6.5 yr.	0.02
Gravidity	1,427	3	2.5	-0.03
Length of labor	1,329	12 hr.	11.3 hr.	0.09
Height of mother	1,026	63 inch.	2.3 inch.	0.06
Weight of mother	1,026	135 pounds	22.7 pounds	0.05
Systolic blood pressure of mother	1,362	124	14.5	-0.01
Diastolic blood pressure of mother	1,362	81	11.4	0.00
Weight of child	1,427	3533 gm.	429.8 gm.	0.14
Weight of placenta	1,427	619 gm.	135.9 gm.	0.13
Area of placenta	1,427	44 sq. in.	8.3 sq. in.	0.13

TABLE III. MEANS AND STANDARD DEVIATIONS FOR VARIOUS FACTORS AND CORRELATIONS WITH BLOOD LOSS FOR TOTAL GROUP

FACTOR	NUMBER OF CASES	MEAN	STANDARD DEVIATION	R WITH BLOOD LOSS
Blood loss	1,658	223 c.c.	208.5 c.c.	----
Age of mother	1,580	27 yr.	6.5 yr.	0.01
Gravidity	1,658	3	2.6	-0.03
Length of labor	1,544	12 hr.	11.2 hr.	0.07
Height of mother	1,176	63 inch.	2.3 inch.	0.07
Weight of mother	1,176	134 pounds	22.5 pounds	0.05
Systolic blood pressure of mother	1,580	124	15.7	-0.02
Diastolic blood pressure of mother	1,580	81	12.0	0.00
Weight of child	1,658	3348 gm.	642.7 gm.	0.14
Weight of placenta	1,658	599 gm.	141.3 gm.	0.16
Area of placenta	1,658	43 sq. in.	8.9 sq. in.	0.14

Like Calkins, we found that age is not related to blood loss since the correlation between these factors is only 0.01. Litzenberg found that the correlation is still approximately zero when only first pregnancies are considered, so that the lack of correlation is not due to the obscuring effect of gravidity. Gravidity itself has a slight negative correlation, -0.03, with blood loss. Parity, according to Calkins, correlates -0.05. Thus, there is indicated a barely noticeable tendency for succeeding pregnancies to be associated with smaller blood loss.

Total length of labor exerts a small but significant* influence on blood loss as indicated by an r of 0.07. However, when the three stages of labor were considered separately by Calkins and his co-workers, they found the third stage to be a little more closely related to blood loss than was the first or second.

Height and weight of the mother are related to blood loss to a similar extent, height correlating 0.07 and weight 0.05. Calkins found slightly higher correlations for these factors, i.e., 0.12 for height and 0.16 for weight. On the average, then, the tall heavy woman may be expected to lose more blood than the short thin one, but in any individual case no estimate of blood loss can be made from the height and weight of the patient.

The blood pressure of the patient is not at all related to blood loss, since the correlation is -0.02 for systolic and exactly zero for diastolic pressure.

Weight of the child correlates 0.14 with blood loss. Litzenberg found this correlation to be 0.21 for first pregnancies and 0.11 for succeeding pregnancies. There is an average tendency for a heavier first born baby to be associated with a greater blood loss.

Similar results are found by correlating the placental dimensions with blood loss, as indicated by a correlation of 0.16 between weight of the placenta and blood loss. Here, too, Litzenberg found the association to be closer ($r = 0.18$) in primiparous women than in multiparous ($r = 0.10$), so that especially in first pregnancies a heavier placenta is associated with a greater blood loss. A larger placenta also goes with greater blood loss as indicated by a correlation of 0.14 between area of the maternal surface of the placenta and blood loss. Area was determined by tracing the periphery of the placenta on heavy paper and then measuring the area by a planimeter. Our correlation of 0.14 is a little higher than 0.10 reported by Litzenberg. Ahfeld's early contention that weight and area of the placenta are associated with blood loss is borne out by the present study, but one must remember that a large placenta and greater blood loss need not necessarily go together in individual cases.

An analysis of the effect of the type of presentation of the infant and type of presentation of the placenta on blood loss is presented in terms of averages, but if the large variability (of 209 c.e.) is kept in mind these average differences must be interpreted with caution.

The Schultz type of presentation of the placenta, occurring in 70 per cent of the cases is associated with an average blood loss of 203 c.e. while the Duncan type, occurring in 30 per cent of the cases, gave

*When the number of cases is over 1,000, r of 0.06 or over is probably significant; that is, in other samples of similar size a positive correlation will result again.

an average blood loss of 270 c.c. Pastore, also, found the Duncan type to be associated with a somewhat greater blood loss.

The type of presentation of the infant, however, has practically no relation to blood loss (as shown by Table IV).

TABLE IV. BLOOD LOSS IN THE THIRD STAGE AND TYPE OF PRESENTATION OF THE INFANT

TYPE OF PRESENTATION OF THE INFANT	NUMBER OF CASES	AVERAGE BLOOD LOSS C.C.
O.L.A.	858	230
O.R.A.	647	219
O.L.P. and O.R.P.	93	212
Breech	48	196
Chin and shoulder	14	179

SUMMARY

Of all the factors studied, none has any marked relation to blood loss. The age of the mother, her blood pressure, and probably her gravidity have no measurable effect; the height and weight of the mother and the total length of labor have a very small but significant relation. The weight of the infant and the weight and area of the placenta are related a little more closely to the blood loss. On the average, the tall heavy woman who has a long labor will lose more blood than the short thin woman who has a short labor. On the average, too, a large baby and a large placenta will result in a greater loss of blood than will a small baby and a small placenta.

Not one of these factors, however, approaches the importance of the management of the third stage of labor in its effect. For it is through improved technique of management that the average blood loss has been reduced from over 500 c.c. at the beginning of the century to about 225 c.c. at the present time.

We wish to acknowledge our indebtedness to Dr. John A. Urner of the Minneapolis General Hospital under whose direction the clinical data for this study were collected.

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THE EFFECT OF CERTAIN SEDATIVES AND ANALGESICS ON UTERINE CONTRACTIONS

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THE common belief that opiates induce a certain degree of uterine relaxation which tends to prolong normal labor, as well as to expose the parturient to an increasing hazard of postpartum hemorrhage, led us to undertake a study of the effect of various sedative and analgesic drugs on uterine motility.

Our object was to establish a record of normal uterine contractions during the first and second stages of labor and to observe the alterations, if any, in these contractions in response to the administration of sedatives.

Various methods for recording uterine activity by means of external appliances fixed to the abdominal wall have appeared in the literature¹⁻⁵ from time to time and have rapidly fallen into disfavor with researchers who tested them.

In 1932 Dodek described a new method of external hysterography.⁵ In our hands so far it has proved unsatisfactory. We have reproduced the apparatus in every detail but have failed to obtain a record of uterine contractions during labor simulating that published by Dodek. The principle upon which the apparatus is based is that "during each uterine contraction the anteroposterior diameters of the uterus and the maternal abdomen are increased. The more severe the contraction the greater is the increase." We have observed that in the first stage of labor the patient frequently complains bitterly of pain but no evidence of change in abdominal contour occurs, and the apparatus fails to register the uterine contraction that has apparently taken place. Extraneous movements, however, such as deep breathing, coughing, movements of the trunk and lower limbs, are recorded. Very strong uterine contractions influence the device, but the record obtained does not permit a true interpretation of the extent and force of the uterine contractions.

The German worker, Reeh,⁶ in 1934 reported the use of an electromechanical hysterotonograph. Some such a method may possibly provide in the future a means of investigation. The last word on external hysterography has not, as yet, been said.

It remained, therefore, for us to continue along the same lines of investigation as previously reported from this clinic for the study of oxytocic drugs.

Though no positive conclusions can be assumed from the contrast of the action of the drug on the postpartum uterus with that on the uterus during labor, it is interesting to note the behavior of this muscular organ in the puerperium. Without having tracings obtained during labor it is mere speculation to assume that a similar response might be obtained from the intrapartum case.

For our observations postpartum patients from the sixth to the eighth day were used. Multiparas who had no perineal tears and had had an afebrile course lent themselves most favorably to the study of uterine motility.

The small rubber bag was introduced into the uterine cavity with strict aseptic precautions. After an initial period of observation, during which the uterus was found to be inactive, uterine motility was initiated by the administration of an oxytocic substance. Ergonovine, orally or intravenously, in 0.4 and 0.2 mg. doses respectively was used. In all cases the activity of the uterus was registered promptly. It was marked by a rapid rise in the tone of the organ, followed by a brief period of tetany which, in turn, was succeeded by intermittent, regular, uterine contractions. These contractions often became successively greater in amplitude as the activity continued. The general tone of the uterus remained above the initial level.

Having established a record of the uterine motility, we proceeded to observe the influence of sedatives given subcutaneously and of analgesics administered orally.

Morphine sulphate, $\frac{1}{4}$ gr. hypodermically produced no appreciable change in uterine motility (Fig. 1-A). The tone was unaffected. It remained constant. The amplitude of the contractions was unchanged in the greater number of cases, while in a lesser number there occurred an increase in the height of the contraction. This phenomenon is frequently seen in the patient who has uterine contractions initiated by ergotrate. The interval between the individual contractions after the administration of morphine was slightly prolonged, indicating a degree of relaxation although the general tone was unchanged. Subjectively the patient experienced nausea and faintness.

Morphine $\frac{1}{4}$ gr. combined with atropine $\frac{1}{150}$ gr. gave similar results. In only two out of ten instances was the regularity of the uterine contractions somewhat altered (Fig. 2-A).

From the tracings obtained one may conclude that the tone and activity of the postpartum uterus are not significantly affected by morphine. How far this holds true for the uterus in labor one cannot state positively. Our observations suggest that the possibilities of extreme relaxation and increased postpartum hemorrhage due to its use as intrapartum and postpartum medication are slight in the absence of deep inhalation anesthesia. The fact that uterine contractions continue regularly and uniformly after the administration of morphine lends further support to the idea that its use during labor secures some analgesia while the uterus continues its normal function, provided there is analogy between the reaction of the postpartum and intrapartum uterus.

However, the ill effect of the drug on the respiratory mechanism of the baby must be borne in mind. Therefore, the optimum dose and the time of its administration during labor should be carefully considered. The uncertainty of the time of delivery, especially in a multipara, in-

creases the danger of subsequent respiratory depression of the baby because of our inability to plan the optimum time of administration to accord with the time of delivery.

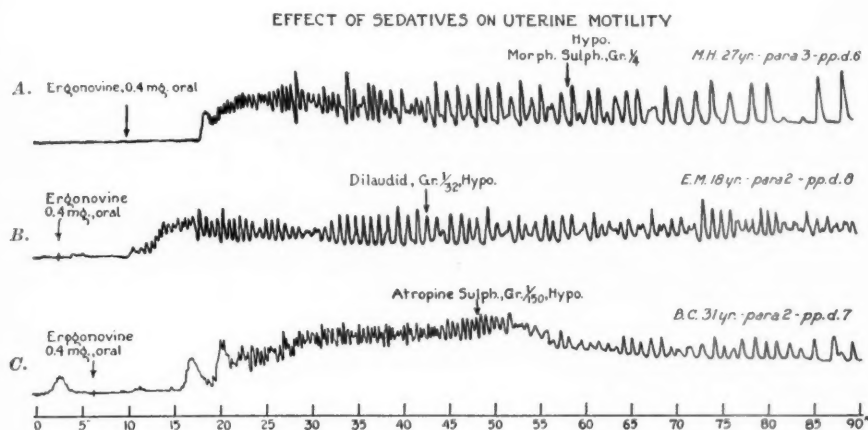


Fig. 1.

Atropine sulphate, $\frac{1}{150}$ gr. given hypodermically, caused a slight fall in the general tone of the uterus (Fig. 1-C). Other workers have observed similar results. The contractions became slightly lower in amplitude, but the uterine activity was never completely abolished. Atropine when used in combination with morphine apparently does not have the power to relax the uterus to any appreciable degree.

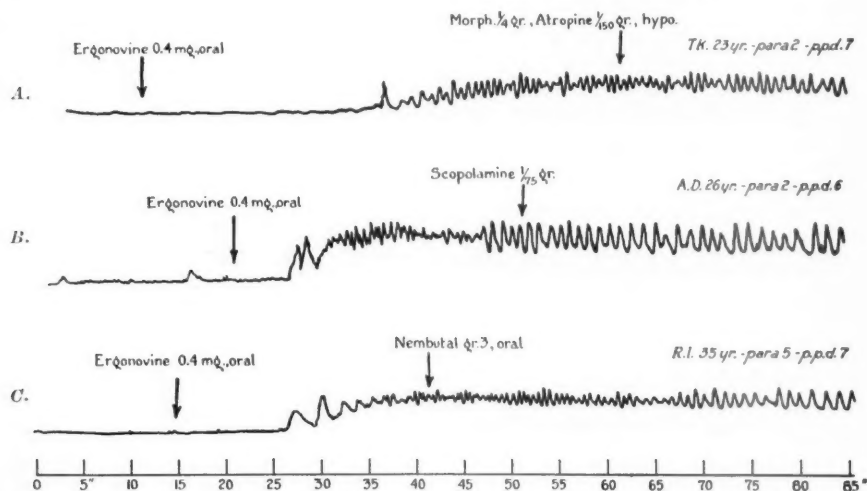


Fig. 2.

Scopolamine given alone in doses of $\frac{1}{200}$, $\frac{1}{100}$, or $\frac{1}{75}$ gr. has a tendency to relax the uterus more or less between individual contractions (Fig. 2-B). A similar effect is noted when it is given in combination with morphine. This may be a causative factor in the prolongation of the first stage of labor if the drug is administered too early. But here again, an analogy between the uterus during labor and that of our

test patient may not hold. The conditions obtaining in each instance are different. Here we are judging quality rather than force of contractions. However, there was certainly no inhibition of activity.

Nembutal, used orally in 3 gr. doses, produced no appreciable change in the uterine activity (Fig. 2-C). The general tone and amplitude of the contractions were unaltered. There was, however, a slight lengthening of the interval between the individual contractions. The analgesic effect of the drug was well demonstrated. While the tracings showed as strong uterine activity as before the administration of the drug, the patient received definite relief from the pains.

Aspirin and codeine did not alter the uterine contractions. Dilaudid, $\frac{1}{32}$ gr. given hypodermically lessened the uterine contractions slightly (Fig. 1-B). The interval between the individual contractions was somewhat lengthened. No diminution in the general tone of the uterine muscle occurred. One is led to suspect that no relaxation of great degree occurs as a result of this drug in the above dosage.

SUMMARY

The method of internal hysterography furnishes the best method for study of uterine activity. Patients in the immediate postpartum period were observed. Uterine activity was initiated with ergonovine and the action of certain drugs commonly employed during labor was studied. While the force of the uterine contractions was not measured, the graphs show what changes were noted.

Further studies along these lines are needed and a safe and sound method for recording uterine activity during labor must be evolved in order that observations on the action of drugs during parturition may receive a direct interpretation and be valuable for clinical application.

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The author describes the technique of a new test for the diagnosis of syphilis, using only a drop of dried blood, (Chediak-Dahr). The advantages of this method over the common diagnostic tests for syphilis are threefold: economy, simplicity, and rapidity. The report is based on 250 confirmed syphilitic patients and 125 confirmed nonsyphilitic patients. The author states that this test is especially valuable when an urgent blood transfusion becomes necessary.

AUGUST F. DARO.

ORAL PARALDEHYDE IN OBSTETRICS

FURTHER REPORT OF 300 ADDITIONAL CASES

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IN A RECENTLY published article, two of the authors reported a preliminary study of 50 cases in which paraldehyde was given per os as an obstetric analgesic, and at this time we wish to present the results of 300 additional patients receiving oral paraldehyde during labor. We also desire to present a more simplified technic than that originally used.

In this series the paraldehyde was combined with aromatic elixir instead of the propylene glycol, alcohol, and syrup of acacia mixture, the result being that the total quantity to be swallowed was much smaller, nausea and vomiting were much less frequent and the taste was as effectively disguised. Elixir aromaticum U.S.P. (simple elixir) is a syrup almost universally used as an agent to improve the taste of liquid medicines; it is easy to procure, inexpensive and perfectly harmless, and in our hands has proved a most satisfactory vehicle for paraldehyde.

TECHNIC

It is no longer considered necessary to wait for any particular amount of cervical dilatation or descent of the presenting part before beginning analgesia, the desire of the patient for relief from pain being the main indication. She is told that she will be given something as soon as she wishes it and is cautioned not to wait too long before seeking relief, otherwise it may be given too late for her to receive the full benefits. Better results are obtained when the paraldehyde is preceded by either $1\frac{1}{2}$ to 6 gr. of pentobarbital sodium, the usual dose being 3 gr., or $\frac{1}{6}$ to $\frac{1}{3}$ gr. of pantopon, it being remembered that the two drugs should not be given in combination. Usually about one hour is allowed to elapse after the preliminary medication before giving the paraldehyde mixture, although this is not absolutely necessary and may be disregarded if labor is progressing quite rapidly. The paraldehyde and aromatic elixir are given in equal parts, the amount ranging from 4 to 6 drams each, the average being 5 drams, the dosage not varying with the age, size, or parity of the patient. The two are stirred briskly and the patient permitted to smell of the mixture or told that the odor and taste are pungent and slightly breath taking. The nostrils are loosely plugged with cotton and the patient is instructed to swallow the dose quickly; she is then given a few swallows of water and permitted to lie down and after a few minutes the cotton is removed from the nares.

If, as happens in a few cases, the patient is nauseated and regurgitates the mixture, an interval of about fifteen minutes is allowed and the administration repeated. In attempting to decrease nausea it is helpful to have the patient breathe

deeply. The paraldehyde, elixir, and glass used should be kept in the ice box, for chilling aids materially in eliminating the slight burning sensation and reduces the odor by decreasing the volatility of the paraldehyde.

SERIES UNDER STUDY

The present study consisted of 300 cases, all of which were observed shortly after the onset of labor and none was especially selected. Approximately one-third of the cases were private and the other two-thirds divided equally between white and colored ward patients. The number of primigravidae as compared to multigravidae was almost 2 to 1, there being 191 and 109, respectively. Ages ranged from thirteen to forty-eight, the greatest number being between twenty and twenty-five years.

As in the previous study and for the same reasons considerable pathology was seen. The various complications and frequency of their occurrence are noted in Table I.

TABLE I. COMPLICATIONS

	NO. CASES
Preeclampsia	34
Chronic nephritis	14
Cardiovascular disease	3
Acute upper respiratory infection (on admission)	28
Antepartum pyelitis	5
Marginal placenta previa	2
Retained placenta	1
Hydramnios	4
Bicornute uterus	1
Congenital dislocation of hip	1
Bronchopneumonia	1
Twin pregnancy	2
Presentation face	1
Transverse arrest	6
Presentation breech	7
Presentation occiput posterior	25
Total	135

No particular attention was paid to the station of the presenting part at the time the paraldehyde was administered. The cervical dilatation averaged 5.5 cm. in the multigravidae and 6.2 cm. in the primigravidae at the time the drug was given. Elective low forceps and episiotomy were done routinely upon all primigravidae when the head reached the perineal floor and the cervix was completely dilated, a procedure also carried out in multigravidae who had had an episiotomy at former delivery. There were 25 occipitoposterior presentations at the time of delivery, 14 of which were delivered as such, 10 were manually rotated and 1 was delivered by the Scanzoni maneuver. Four cases of transverse arrest were delivered by low forceps and 2 by midforceps.

TABLE II. METHOD OF DELIVERY

METHOD	PRIMIGRAVIDAE	MULTIGRAVIDAE	TOTAL
Spontaneous	2 (1%)	69 (62%)	71 (23.5%)
Low forceps	175 (91.5%)	35 (32%)	210 (70%)
Midforceps	10 (5%)	4 (4%)	14 (4.5%)
Breech extraction	5 (2.5%)	2 (2%)	7 (2%)

A number of additional operations were also done as the majority of patients had a routine cervical inspection following delivery with repair of any laceration; and a number of multigravidae with relaxed vaginal outlets had a posterior repair (elective perineorrhaphy) following delivery. All of the additional operations are enumerated in Table III.

TABLE III. ADDITIONAL OPERATIONS

Episiotomy	202
Perineorrhaphy elective	35
Trachelorrhaphy	54
Hysterostomy	4

Supplementary anesthesia was necessary for operative deliveries. Inhalation (N_2O-O_2 or ether) was used unless contraindicated, but always in greatly reduced amounts. The operative delivery of patients in whom inhalation anesthesia was contraindicated and the majority of elective perineorrhaphies were carried out under local infiltration and pudendal block. No supplementary anesthesia was required in the normal spontaneous delivery.

RESULTS AND DISCUSSION

The disagreeable taste and odor of oral paraldehyde were disguised by aromatic elixir. Five drams of paraldehyde and 5 drams of the elixir were given at the initial dose. No patients refused the mixture when it was offered to them and none complained of its unpleasantness. Their description of the drug was wide and varied and the greater majority definitely stated that they did not mind taking it at all. Amnesia began in ten or fifteen minutes and was complete in twenty or thirty minutes, complete amnesia being obtained in 94.3 per cent of the cases. Since we have begun to give the mixture earlier in labor the duration of amnesia before delivery has been increased. Primigravidae averaged three hours and thirty minutes without memory before delivery (minimum of one hour and maximum of eleven hours). Multigravidae averaged two hours and thirty minutes (a minimum of thirty minutes and a maximum of three hours) of amnesia before delivery. All patients slept for a few hours following delivery and drowsiness with unconcern and disorientation persisted for several hours.

The patient laboring under the influence of paraldehyde is sleeping, she rolls about with each contraction and utters an occasional groan. Sideboards on the bed are all that is necessary to keep her from harming herself, and someone in constant attendance, while advisable, is not needed, and the individual present need not be a physician or nurse, but merely someone to prevent the patient from rolling out of bed when the sideboards are not available. Restlessness of any undue degree is practically never seen, nor is restraint ever necessary.

The average duration of labor for the primigravidae was fifteen hours and six minutes (a maximum of thirty-six and a minimum of four). Multigravidae averaged nine hours and thirty minutes (a maximum of twenty-five and a minimum of two and one-half (see Table IV).

TABLE IV. DURATION OF LABOR

HOURS	PRIMIGRAVIDAE	MULTIGRAVIDAE	TOTAL
0-10	70 (36%)	56 (51%)	126 (42%)
10-20	79 (41%)	51 (47%)	130 (43.5%)
20 plus	42 (23%)	2 (2%)	44 (14.5%)

In the original paper it was stated that no oxytocics were used during labor, and that a temporary decrease in the intensity of uterine contractions was observed for a few minutes following the administration of paraldehyde. In this series 12 patients received 2 or 3 minims of pitocin intramuscularly to increase the uterine contractions. No frank case of uterine inertia was observed but these patients that received oxytocics were not having the expected type of labor. Pitocin thus administered did not have ill effects and the desired objective was obtained.

The number of spontaneous deliveries appearing is rather small, however 69 or 62 per cent of the 109 multigravidae delivered spontaneously. Taking into consideration that elective low forceps were used in all primigravidae and in multigravidae having had former episiotomy, the corrected percentage of multigravidae delivering spontaneously (72 per cent) is convincing that operative interference is not absolutely necessary. The expulsive efforts of the mother are present and not decreased, and the efficacy of the drug as an analgesia in the home established, although a word or two of caution is necessary if it is to be used in these surroundings; it must be remembered that the patient is asleep and the progress of labor cannot be determined by watching her and observing the intensity of her pains, and the labor is likely to be shorter than if she had not received relief. Therefore closer supervision by the physician is necessary and the progress must be determined by abdominal palpation and rectal examination.

Pulse, respiration, and blood pressure are not changed in any great respect as compared to the normal case. There is a definite lowering of the blood pressure in all cases of hypertension, but not in the normal case, and we are convinced that there is great value in using paraldehyde in patients suffering from preeclampsia and eclampsia. We have seen paraldehyde lower blood pressure in cases where other drugs have failed, and it is our policy to use it whenever possible in hypertensive cases. No alarming drop of blood pressure was noted in any single case which could not be accounted for by her type of delivery or shocking procedure she received.

Blood loss not discussed previously has been carefully considered in this series, because of the fact that a number of questions are always raised as to whether or not paraldehyde has an ill effect upon uterine tone. The average blood loss for each case was 240 c.c. Five patients were considered as having had postpartum hemorrhage (500 c.c. or more). One was a case of multiple pregnancy with polyhydramnios and retained placenta. The blood loss was estimated as 1,200 c.c. Another patient had an extensive cervical laceration and lost an estimated amount of 1,000 c.c. The other three hemorrhages were of 500, 600, and 700 c.c. quantities and were attributed to partial uterine atony. All patients responded well to intravenous oxytocics, fluid, and blood and all made uneventful recoveries. We can thus say that paraldehyde has not increased the incidence of postpartum bleeding.

Nausea occasionally occurred after paraldehyde was given and vomiting only seldom. Thirty-eight patients vomited the initial dose and 34 of these retained a second dose given ten or fifteen minutes later. A number of patients who had prolonged labor required the administration of a second or third dose, the amounts being smaller than originally given. This was done without difficulty and no harm apparently resulted to baby or mother. There were in the series 22 patients who received this additional oral paraldehyde. There were 20 failures (6.6 per cent); 6 due to vomiting, 5 due to rapid labor, and 9 in which patients received only relative or partial amnesia.

There were no maternal deaths in this series. One patient aspirated vomitus at the time of nitrous oxide induction, developed a postoperative bronchopneumonia and ran a febrile course for a few days. Morbidity was present in 10.6 per cent of the patients, all of them being subacute and discharged from hospital in good condition.

All babies were carefully observed and of the 302 births, 8 were premature and 294 full term. Twenty-six of the full-term babies required moderate resuscitation before breathing was thought to be regularly and independently established. Five of the babies were sleepy in the nursery for twelve hours and several had the odor of paraldehyde on their breath for six to eighteen hours, but none of the babies exhibit-

ing these effects were a source of concern and all went through a normal neonatal period. We do not believe that paraldehyde is harmful to the full-term baby. Four of the 8 prematures required resuscitation by means of intratracheal aspiration and insufflation, the other 4 cried immediately and required no resuscitation. The concentration of the drug upon the vital centers in the premature seems to be more profound but not dangerously so. The gross fetal mortality was 5; 1 baby died eight hours after birth, and postmortem examination revealed massive congenital atelectasis and the odor of paraldehyde upon all viscera. While death may be attributed to paraldehyde, it is our impression that the occurrence of this condition might be seen in any normal series of this size. The second, a stillborn following a prolonged second stage caused by a face presentation, was autopsied and found to have intracranial hemorrhage. The third occurred in a patient with chronic nephritis, was a stillborn infant, and the fetal heart was not heard upon admission. The fourth was a case of a true knot* of the umbilical cord with evidence of gangrene at the proximal end and again fetal heart was not heard upon admission. One premature baby died on the sixth day the cause of death being prematurity and septicemia.

CONCLUSIONS

1. The use of oral paraldehyde as an obstetric analgesia is definitely established.
2. Oral paraldehyde can be satisfactorily administered in equal parts with aromatic elixir.
3. There are no contraindications to paraldehyde in labor.
4. Expulsive efforts of the mother are not diminished or abolished.
5. Complete amnesia is obtained in over 90 per cent of the cases.
6. Oral paraldehyde does not prolong the duration of labor.
7. There are no detrimental effects upon the mother.
8. There is a definite lowering of the blood pressure in hypertensive cases and the drug is recommended for the handling of preeclampsia and eclampsia.
9. There is no increase in postpartum bleeding.
10. No fetal deaths in this series can be attributed to paraldehyde.
11. It is perfectly safe for use in the home.

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A WORKING CLASSIFICATION OF ADNEXAL CYSTS AND NEOPLASMS*

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THE adnexa are real hotbeds of cysts and neoplasms, both benign and malignant. They are also frequent sites of inflammation, and the inflammatory mass often is difficult to differentiate clinically from benign or malignant cysts or neoplasms. The changes, which are numerous in the ovary, continue from puberty to after the menopause; this factor, together with the fact that the ovary contains many types of undeveloped cells and embryonic rests, may account for the high incidence of neoplasms. On account of the multiplicity of the lesions which affect the ovaries, parovarium and Fallopian tubes it is helpful in diagnosis and treatment to classify them by a simple, clear and concise method.

SIMPLE OVARIAN CYSTS AND INFLAMMATORY LESIONS

The age at which a patient submits herself for a pelvic examination is often important in determining the type of lesion under consideration. For example, it is more common to encounter inflammatory lesions in the third and fourth decades of life than in any other period. A mass which involves the adnexa at this time, and which is more or less cystic and tender to palpation, is likely to be an inflammatory, tuboovarian cyst. If some involvement is palpated on the other side, the diagnosis becomes more certain and treatment is readily advised. In delayed cases, when a tuboovarian cyst becomes definitely established, it may reach large proportions and become difficult to distinguish from an ovarian cyst. Even when the abdomen is open at operation the diagnosis may not be obvious, but when sacculated accumulations of serous fluid (inflammatory cysts) are situated over the uterus, broad ligaments and cul-de-sac the diagnosis of an inflammatory lesion can be made with reasonable certainty.

Simple cysts are also more common in the young than in the older individual, since the greatest physiologic activity of the ovary is at the lower ages. Fortunately, the majority of these cysts rupture spontaneously; this occurrence may be characterized by indefinite lower abdominal distress for twelve to twenty-four hours. Occasionally this

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distress is secondary to the rupture and unless the physician is alert to these events, unnecessary operation may be advised. An appendicectomy has been mistakenly performed incident to the sequence of symptoms of rupture of a Graafian follicle cyst. When simple cysts do not rupture they may attain considerable size and may be easily discernible by bimanual examination. These cysts usually are not tender unless they are associated with secondary inflammation or torsion and they are either unilocular or multilocular. The majority of them are unilocular. If a simple cyst is judged to be more than 10 cm. in diameter, it is unlikely that it will disappear spontaneously. However, if there are no symptoms which require immediate surgical interference in cases of movable cysts it is safe to defer interference for two to three months, since these cysts, if patients are less than thirty-five years of age, are rarely neoplastic.

If a cyst is small, or if it is large, and is somewhat fixed under the broad ligaments or in the cul-de-sac, either a corpus lutein cyst or a benign dermoid cyst must be suspected. To distinguish between the two is not often possible clinically unless a roentgenogram reveals the presence of teeth or some calcium or bony deposit. The chocolate or tarry cysts of young women require most careful consideration. They are always benign but the interference with menstrual and reproductive functions may become irreparable. Surgical treatment must be instituted reasonably early, so that sufficient ovarian substance can be retained to influence the menstrual function if not the reproductive ability. Unfortunately this group of cysts is much larger than it is usually considered to be, and since the happiness of many women depends partly on their power of reproduction, these lesions, which have a decided tendency to destroy it, should receive more attention.

Benign dermoid cysts make up about 10 per cent of all cysts. They rarely produce symptoms unless they become secondarily infected or twisted. They are likely to become infected because of their sebaceous content and their close proximity to the sigmoid colon. A twisted ovarian dermoid rapidly becomes necrotic and then purulent, with the usual sequence of an acute pelvic inflammatory mass. Under such circumstances, surgical treatment is indicated at once. Great care is required during removal of these cysts to avoid rupture and secondary peritonitis. When they are not twisted or acutely inflamed, the gross appearance of their surface, which resembles frosted glass, easily distinguishes them from the usual unilocular, simple cyst.

BENIGN OVARIAN NEOPLASMS

The cystadenoma is the outstanding example of this group of neoplasms. The tumor arises in the substance of the ovary, in contradistinction to the simple follicular cyst. It can be unilocular but it is more frequently multilocular and contains a watery or mucoid material.

It is the tumor most frequently encountered in the ovary and although it is not confined to any decade of life, it is usually seen when patients have passed the fourth decade. A cystic tumor that completely fills the abdomen of a child is most likely to be of this type. It is most often confused with the papillary cystadenoma which, under this classification, is designated as malignant and will be alluded to later. Since these cysts are usually large and benign, and are not infected, their removal is facilitated by evacuation of their content without fear of contamination of the peritoneal cavity. The prognosis always can be stated to be excellent.

Under benign neoplasms, in order of their importance, are classed endometrioma (endometriosis), fibroma, leiomyoma, and luteoma. Of this group endometriosis, which is closely allied to the tarry cyst, is the most common and the most important since it is encountered when patients are between twenty-five and thirty-five years of age and it has a decided tendency to destroy the reproductive function. The process is, of course, not confined to the ovary but in advanced cases will extend to the uterus and sigmoid colon. These structures may all be adherent in one mass, and if so the only treatment is surgical extirpation with castration. In some of the less involved conditions, and if one ovary is relatively free from the process, then conservative surgical treatment is in order, with a view to retaining the menstrual function if not the reproductive function. If patients have been fortunate enough to have a family before the disease becomes extensive, the latter function need not be given consideration.

Fibroma, leiomyoma, and luteoma are rare benign tumors and of little clinical interest. These are almost all encountered in women who have passed the menopause. Their presence is usually made known by their unusual weight and their removal is indicated.

MALIGNANT OVARIAN NEOPLASMS

Malignancies of the ovary have been studied by gynecologists and pathologists for a long time and many methods of grouping these tumors have been suggested. The classification here proposed (Table I) is not based so much on the histologic nature of the tumor as on the rate and manner of growth of the tumor and what it does to the patient. For example, some tumors grow slowly while others grow rapidly and recurrences are the rule. It is to be noted that the term "papillary" in this classification indicates malignancy. It is pathologically sound to regard and to treat as malignant any tumor which results in the formation of papillary epithelium, particularly if the growth tends to perforate the primary wall and to implant itself on adjacent structures. To do otherwise is to court disaster. Papillary epithelium behaves about the same wherever it is seen. If it appears in the urinary bladder it may or may

TABLE I. ANATOMICOPATHOLOGIC CLASSIFICATION OF ADNEXAL CYSTS AND NEOPLASMS

I. Ovaries

A. Cysts

1. Inflammatory (subserosal)
2. Simple
 - a. Unilocular
 - b. Multilocular
3. Cysts of corpus luteum
4. Dermoid cysts (benign)

B. Neoplasms

1. Benign
 - a. Cystadenoma
 - (1) Unilocular
 - (2) Multilocular
 - b. Adenomyoma (endometriosis)
 - c. Fibroma
 - d. Leiomyoma (fibromyoma)
 - e. Luteoma
2. Malignant
 - a. Papillary adenocarcinoma
 - b. Carcinomatous cystadenoma
 - (1) Papillary
 - (2) Nonpapillary
 - (3) Mixed
 - c. Solid carcinoma
 - d. Carcinomatous dermoids
 - e. Luteoma
 - f. Teratoma
 - g. Sarcoma
 - h. Secondary carcinoma
3. Neoplasms of questionable nature
 - a. Granulosa cell tumor
 - b. Arrhenoblastoma

II. Parovarium

A. Cysts

1. Unilocular
2. Multilocular

B. Neoplasms

1. Leiomyoma

III. Fallopian tubes

A. Cysts

1. Hydatids of Morgagni

B. Neoplasms

1. Benign
 - a. Adenomyoma
2. Malignant
 - a. Adenocarcinoma
 - b. Squamous cell carcinoma
 - c. Secondary carcinoma
 - d. Sarcoma (rare)

not be quiescent but if it is disregarded eventually it will kill the patient. The same can be applied to the ovary and it is for these reasons that the term "benign papillary cystadenoma" is not included here. If the tumor is papillary it is malignant and is so classified.

Papillary adenocarcinomata originate, as a rule, from the surface of the ovary and range from a low to a high grade of malignancy. Since they extend from the cortex of the ovary, they become attached early to adjacent structures and shortly they assume such proportions that they are regarded as inoperable. Ascites is the rule and metastasis to the omentum, bowel, and parietal peritoneum occurs within a few months. It is known that, given this type of malignancy, the prognosis is generally poor, but it is to be remembered that the secondary growths may become quiescent following removal of the primary tumor, followed by radium and Roentgen therapy. The longest duration of life following such a procedure, within our experience, if ascites and metastasis existed, was twenty years. There is a high incidence of bilateral involvement in these cases, so that if the papillary growth is still confined to the ovary, it is far safer to remove both adnexa and the uterus. Unless these patients are too greatly debilitated from the malignancy, they should be subjected to exploration and the question of operability determined.

Malignant ovarian cysts are designated "carcinomatous cystadenomata" and they compose one of the most important groups of tumors encountered in the pelvis. They are of interest because they are usually multilocular, and about 50 per cent are bilateral. The malignancy varies in grade but the majority are of Grade 1 or Grade 2. The malignant tissue remains confined within the cyst for long periods, which characteristic is in the patient's favor, since it is possible completely to remove the cystic tumor and cure the patient. When they perforate it is usually near the pedicle or at points of greatest pressure, so that care must be exercised during their removal. Cysts of low grade of malignancy may be filled with pseudomucin, but if the content is watery or bloody it is indicative of a more rapidly growing tumor. They are grouped as "papillary," "nonpapillary" or "mixed papillary and non-papillary."

The solid carcinomata of the ovary represent a much smaller group but they also vary in rate of growth. There is a high incidence of pelvic attachment and extension to distant nodes. Ascites is a frequent finding and a bad one in relation to prognosis. These tumors are best studied separately from the cystic malignant growths and the papillary adenocarcinomata.

Carcinomatous dermoids occasionally are encountered; this makes it necessary to regard dermoids as malignant until they are proved to be benign. The consequence of a neglected malignant cyst of this nature is 100 per cent fatality because the carcinoma is usually an epithelioma of

high grade of malignancy. Attachment or perforation of the capsule stamps them as incurable. However, the opposite is true; that is, if they are unattached cure is almost sure to follow surgical removal.

A luteoma is a solid tumor which, although usually benign, occasionally grows locally and is productive of the condition designated as pseudopregnancy. The tissue is typically yellow and is not highly malignant. Complete removal always should be attempted.

Other solid malignant growths are teratomata, sarcomata, and secondary carcinomata. Histologic description here is unnecessary but the importance of early surgical treatment of these tumors should be stressed. Teratomata and sarcomata are highly malignant but usually curable, as they can be removed before extension to adjacent structures has taken place. Secondary carcinomata including Krukenberg's tumors represent metastatic growths on the surface of the ovary from other carcinomata, usually of the stomach, and are therefore inoperable. Discovery of bilateral ovarian tumors which are covered with a mucoid substance should at once lead to the suspicion of a Krukenberg tumor, and if the growth is of this nature further treatment is useless.

NEOPLASMS OF QUESTIONABLE NATURE

There is a group of tumors which probably arises from embryonic rests or indifferent cells in the substance or in the hilum of the ovary, the benignancy or malignancy of which is not definitely settled. Some, such as the arrhenoblastoma, produce a hormone which gives rise to masculine secondary sexual characteristics. Another more common tumor, which occurs after the menopause, is the granulosa cell tumor. Under its hormonal influence, periodic postmenopausal menses may occur. All symptoms subside following local removal of the tumors.

PAROVARIAN GROWTHS

Cysts which occur in the parovarium may be both unilocular and multilocular; malignancy in them is practically unknown. The only neoplasm to be considered is the leiomyoma and when it is seen it usually is in conjunction with uterine leiomyomata.

TUMORS OF THE FALLOPIAN TUBES

Hydatids of Morgagni frequently occur at the fimbriated ends of the Fallopian tubes, but are of little clinical or surgical significance. Neoplasms of the Fallopian tubes are both benign and malignant. The adenomyoma is the only benign lesion of importance and occurs as a rule together with generalized endometriosis, although independent adenomyomas are seen. If they produce pain excision is indicated.

Primary malignancies of the Fallopian tubes are rare. Adenocarcinoma and squamous cell carcinoma have been described. Secondary carcinoma

is more common and can be a tumor of Krukenberg type or an extension from a fundal cancer or an ovarian papillary adenocarcinoma. Sarcoma of the tubes is extremely rare.

SUMMARY

The classification given herewith is on an anatomicopathologic basis. It is sufficiently descriptive and is not confusing. In dealing with ovarian cysts and neoplasms sufficient knowledge of their characteristics and behavior is necessary for appropriate treatment to be instituted.

THE TREATMENT OF HABITUAL ABORTION BY PROGESTERONE

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THE use of progesterone and progestin-containing extracts in the treatment of habitual abortion has a definite experimental background. The reader is referred to the works of Corner, and Corner and Allen¹⁻³ for historical and experimental data. Suffice it to say that the presence of the corpus luteum, active extracts of the tissue, or the chemically pure hormone itself is necessary for the maintenance of normal pregnancy in the rabbit. In the human being, the corpus luteum remains active up to the fourth month, when it begins to degenerate slowly, usually until about the sixth or seventh month, when there remains little or no evidence of its presence. Pratt⁴ has demonstrated that there is less than one international unit of progesterone in 40 gm. of human corpus luteum, and Bloch⁵ has shown that there is less than 1 unit in each of 8 and 12 liters of sow's blood. These observations probably mean that production and utilization of the hormone are continuous and that there is little storage. The amount used in the treatment of habitual abortion must of necessity be empirical until sufficient cases have been followed and further experimental work has been done.

Below are reported the results of treatment of eight cases of habitual abortion with progesterone or progestin-containing extracts. The general method of treatment followed was the intramuscular injection of progesterone, weekly, as soon as pregnancy was established up to, and including, the sixth lunar month of gestation. In each of the following cases, only the essentials are reported. In all patients the blood Wassermann was negative, and nothing could be elicited from the history, physical examination, or laboratory data which might account for the abortions, except in Case 6 where a Dudley operation had been performed. Two patients, Cases 4 and 8, had stigmata of an early pituitary failure.

CASE 1.—A thirty-seven-year-old para 0, gravida iv, whose first pregnancy terminated at seven months with a living female child weighing $3\frac{1}{4}$ pounds which died within a few hours. The second and third pregnancies terminated spontaneously at three and four months, respectively. The last menstrual period for the fourth pregnancy was Oct. 1, 1934, and the estimated date of confinement was July 8, 1935. Pregnancy was uneventful until Jan. 30, 1935, at which time the patient had cramps and bleeding. Morphine was given and bed rest instituted. Four international units of progesterone were given, and this amount continued every other day for ten days. No therapy was given for the next ten days, and then four international units of progesterone were given every other day for six doses. Early in March, the patient had slight spotting with cramps, and this occurred again in the latter part of March. Pregnancy was again uneventful until June 27, 1935, at which time there was some spotting. It is interesting to note that at the site of all injections, there occurred local allergic-like reactions which persisted for about two weeks after the last injection. The patient was delivered of a 3,150 gm. living, normal female child. A total of 44 international units of progesterone was used.

CASE 2.—A twenty-five-year-old para 0, gravida iv, whose first pregnancy ended in a spontaneous abortion at four months. The second ended in the third month and the third in the second month. Vitamin E was given during the second pregnancy without effect. The last menstrual period was Apr. 1, 1935, and the estimated date of confinement Jan. 7, 1936. Pregnancy was established by examination and ovulation test, and on May 14, 1935, 5 K.U. (1 international unit) of proluton¹ was given. On May 15 there was some bloody show but no cramps. This occurred again on June 15. One international unit of progesterone was given weekly until Nov. 8, 1935. The patient was delivered of a normal, full-term, female child, weighing 3,650 gm. Thirty-one units of the hormone were used.

CASE 3.—A thirty-two-year-old para 0, gravida iii, whose first pregnancy ended in a seven-month-premature child which was dead at birth. The second pregnancy terminated spontaneously at five months. This patient had obvious stigmata of pituitary failure which no doubt dated from the time of puberty. The menstrual cycle had always been very irregular and her build tended toward the masculine, with male distribution of pubic hair. On pelvic examination, there was a fibroid on the fundus about 4 cm. in diameter and one on the cervix about 3 cm. in diameter. One international unit of progesterone was given weekly from Oct. 10, 1936, to Jan. 21, 1937, a total of 14 units. On Nov. 23, 1936, the patient spotted for one day without pain. Pregnancy was otherwise uneventful. A 2960 gm. male child was delivered Apr. 8, 1937. The infant was very cyanotic and circumoral cyanosis persisted for seven days. The testes were small, and that on the left was undescended. X-ray showed a definitely enlarged thymus which was treated by the usual procedures. On discharge from the hospital and six weeks later the infant appeared normal. The placenta was about normal in size and grossly had a peculiar purplish gray sheen. Microscopically, it showed normal tissue.

CASE 4.—A twenty-nine-year-old para 0, gravida iv, who aborted at two months in 1933, at two months in 1934, and at four months in 1935. The last menstrual period for the present pregnancy was May 15, 1935. She was given one unit of progesterone from July 2 to October 7. A 3,480 gm. normal female was delivered Feb. 8, 1936. A total of 19 international units of the hormone was used.

CASE 5.—A twenty-nine-year-old para i, gravida v, whose first pregnancy terminated in a full-term delivery in 1926. The next two pregnancies terminated at four months and the fourth at six months. The last menstrual period for the fifth pregnancy was Feb. 19, 1936, and the estimated date of confinement was Nov. 26,

1937. One unit of progesterone was given weekly, beginning Apr. 7, 1936, up to and including June 29, 1936. During the early months of pregnancy, the uterus was retroverted, but spontaneously assumed the anterior position at about three months. A normal 3330 gm. female was delivered Nov. 8, 1937. A total of 10 units of the hormone was used.

CASE 6.—A twenty-eight-year-old para 0, gravida iv, who aborted in 1931, 119 days after the last menstrual period; again in 1933, 111 days after the last menstrual period; again in 1934, 112 days after the last menstrual period. The last menstrual period for the fourth pregnancy was Apr. 20, 1935. She was under the care of another physician who referred her for progesterone therapy. One international unit was given on July 18, three units on the twenty-second, 5 units on the twenty-seventh. On the twenty-ninth of July she complained of bearing-down pain but had no bleeding. Another unit was given on the twenty-ninth. Three units were given on August third and fifth, since she was nearing the time of her previous abortions. On August 9, she complained of a sensation of heaviness in the pelvis not unlike that experienced with her previous abortions. She was given $\frac{1}{4}$ gr. of morphine and five units of progesterone. On the tenth of August, she noted something bulging from the vulva but had experienced no pain. She was obviously aborting and was therefore hospitalized. A 17 cm. normal fetus and a 7 cm. placenta were delivered. Bleeding was profuse, necessitating packing. Examination showed that the cervix had a laceration extending from the external os through the internal os, on the posterior lip. This was obviously responsible for all the abortions within the neighborhood of 110 days. On the seventh day, the laceration was repaired and the patient advised to become pregnant again, which she has been reluctant to do. A total of 24 units of progesterone was used.

CASE 7.—A twenty-nine-year-old para 0, gravida iv, whose first pregnancy was a miscarriage at six months of a $2\frac{1}{2}$ -pound stillborn fetus. The second was at two months, and the third was an 800 gm. fetus at six months. The last menstrual period for the fourth pregnancy was Aug. 4, 1936, and the estimated date of confinement May 11, 1937. One international unit of progesterone was given weekly from Sept. 23, 1936, to Mar. 8, 1937. A 4150 gm. normal male child was delivered May 13, 1937. There was a 1,000 c.c. postpartum hemorrhage. Twenty-one units of the hormone were used.

CASE 8.—A thirty-four-year-old para 0, gravida v, who had had gonorrhea. In addition there was some evidence of anterior pituitary dyscrasia. The first pregnancy terminated at two months, the second was twins at three months; the third at three and one-half months, and the fourth at five months. The last menstrual period of the fifth pregnancy was Feb. 26, 1937. Beginning March 23, one unit of progesterone was given weekly. On May 15, there were spotting and dull backache. Five units of progesterone were given and $\frac{1}{4}$ gr. of morphine. The uterus at this time was the size of a three months' pregnancy, and the cervix was closed. Again on June 5, 1937, she had lower abdominal and back pain and was given 5 units of progesterone. Pregnancy was uneventful until July 9, 1937, when she began to pass fluid per vaginum, had a feeling of heaviness in the pelvis, but no pain or bleeding. Examination at this time showed the cervix 2 cm. dilated and membranes bulging. Labor pains started, membranes ruptured and a normal stillborn fetus was expelled July 11, 1937. It weighed 170 gm. and was 21 cm. long. The placenta and cord appeared normal. Examination after delivery showed no pelvic abnormality. A total of 25 Rb. U. were used.

Of the eight patients whose pregnancies have terminated, there are 2 failures, one which can be attributed to the Dudley operation (Case 6). The only abnormality so far as the fetus or placenta was concerned

was in Case 3. The amount of progesterone used varied from 10 to 44 international units in the individual cases. Four of the 8 patients had some bleeding, and one had bleeding with cramps. Obviously no hard and fast rule for treatment can be given from this small series of cases, but they are presented and reported with those of other investigators so that the effect of the hormone can better be evaluated.

Knab⁶ cites two cases treated with 2 K.E. of luteogan on two successive days. The patients up to the fourth month were apparently progressing satisfactorily. Beyond the fourth month observations are not reported. Sellheim⁷ treated 9 patients with serum of pregnant women by giving 10 c.c. every fourteen days. His results are reported as satisfactory. Krohn, Falls, and Lackner⁸ reported 8 cases of habitual abortion in a series with threatened abortion. Cases 5, 6, 9, 11, 12, 13, 16, and 19 were given one international unit of progesterone twice weekly until the thirty-second week. Kane⁹ reported 40 cases. Of these 40 patients, 20 had had one previous abortion, 14 had had 2, 4 had had 3, 1 had had 4, and 1 had had 6 previous abortions. Of the 40 patients, 10 had 1 living child each and then had aborted one to three times subsequently. Kane reported 4 failures. One pregnancy ended at six months. In another, a two-month fetus was expelled after five months' treatment, and there was 1 abortion at two, and 1 at three months. Kane treated his patients as follows: Proluton (progesterone) in 1/25 international units was given every other day for 10 doses. This was repeated at three-week intervals up to the thirty-second week. At the most, his patients received a total of 2 international units of the hormone. In addition to the hormone, each patient received 0.5 gr. of desiccated thyroid three times a day for four weeks, and 4 gr. of sodium iodide three times a day for two weeks following the thyroid medication. All medication was stopped at six months. In his series, Kane noted a definite increase in fetal abnormalities.

DISCUSSION

The causes of habitual abortion are many and varied, and the lack of the hormone produced by the corpus luteum is only one. Hypovitaminosis, hypothyroidism, defective decidual reaction, malformation of the ovum are a few of the causes other than chronic systemic disease. In his series, Kane⁹ reported the incidence of fetal malformations higher than normal, which indicated defective ova or defective decidual reaction. Perhaps some of these cases would have aborted if not treated. In some of the cases reported by the writer and other authors, some of the patients had had one full-term delivery followed by a series of abortions. All of these patients were treated successfully. One can only postulate that perhaps corpus luteum function was defective with succeeding pregnancies and that this state is liable to exist, just as one is subject to transient or permanent states of hypothyroidism.

The matter of dosage necessary to maintain pregnancy in the human being is at present empirical. The series reported by the author shows that from 10 to 44 units were successfully employed through six lunar months. Kane⁹ gave only a total of two units over a period of thirty-two weeks. Sellheim⁷ gave only 10 c.c. of serum from pregnant women every fourteen days with good results, and Krohn, Falls, and Lackner⁸ gave two units weekly from thirty-two weeks. The knowledge of the physiology of the ovarian hormones is not exact when one considers the amount used

above, the small amounts necessary to relieve dysmenorrhea,¹⁰ and the large doses necessary to prepare a premenstrual endometrium in the human castrate (190 units).¹¹ No conclusion can be drawn from the series of cases presented and those cited from the literature as a proof that progesterone is effective. To do this, it will be necessary to have a very large series of cases so that the effect of the hormone can be evaluated statistically. Similar conclusions could be reached if in the same patient every other pregnancy should be treated with the hormone. No hormone therapy should be employed other than progesterone.

CONCLUSIONS

A series of eight cases of habitual abortion treated with progesterone are presented, to be considered with those already reported by the authors quoted. The patients in the cases presented were treated with from 10 to 44 international units of progesterone during the first six lunar months of pregnancy. No other form of endocrine therapy was used. There was one failure due to an operative laceration of the cervix, and one not as yet accounted for. Half of the patients had spotting, and one had spotting with cramps. All infants were apparently normal with the possible exception of Case 3. Smaller amounts of the hormone than one unit weekly may be sufficient to carry a pregnancy to term.

The author wishes to thank Schering Corporation for supplying part of the progesterone (proluton) used in this study.

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The authors report two deaths following electrocoagulation of the cervix.

I. On the ninth day following the admission of a patient complaining of menstrual disturbance and some pain in the lower abdomen, after rest in bed and hot vaginal douches, electrocoagulation of the cervix was performed because of a chronic endocervicitis. A generalized peritonitis occurred. The patient died four days later. At autopsy the diagnosis was confirmed.

The second patient complained of metrorrhagia and menorrhagia. Diagnosis of chronic cervicitis was made. Electrocoagulation of cervix was done on May 24, 1937. On June 9, she was admitted to the hospital with abdominal pain and distention. She died on June 13, and the diagnosis of generalized peritonitis was confirmed at autopsy.

MARIO A. CASTALLO.

THE COINCIDENCE OF PLACENTA PREVIA AND CONGENITAL MALFORMATIONS

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IN 1923, Greenhill¹ found references in the literature to 15 instances in which the birth of a congenitally malformed infant had been complicated by placenta previa; to this number, he added 6 cases from his own experience. These observations, together with a consideration of the theories dealing with the origin of placenta previa and congenital defects, led him to conclude: (1) "... that there is a not infrequent association between the two conditions," and (2) "... that the monsters associated with placenta previa are due to the faulty relation between the placenta and the fetus which gives rise to arrests in development."

No reports dealing with this association have appeared in the intervening years. This fact can be explained by the relative infrequency of the conditions as they occur independently of each other. Lack of such data, together with the opportunity afforded by my investigation of families possessing congenitally malformed children, prompted the writing of this report.

MATERIALS AND METHODS

Observations are presented upon: (A) The occurrence of placenta previa in a series of women bearing malformed children and (B) the birth of malformed children to a group of women suffering from placenta previa.

A. *Placenta Previa in Women Bearing Congenitally Malformed Children.*—The material forming the basis for this part of the study was secured in the following manner:

There were found in the files of the Bureau of Vital Statistics, Department of Health of the State of Pennsylvania, 130,132 death certificates for stillborn and live born individuals who died in Philadelphia during the five years between Jan. 1, 1929, and Dec. 31, 1933. Each of these certificates was examined and the data on those noting the existence of any congenital defect were transcribed to duplicate official forms; 1,476 such certificates were located.

The deceased individual was considered to have possessed a defect under either of two conditions: (1) if the defect involved the surface of the body, or (2) if internal, its presence had been disclosed by operation or necropsy. Diagnoses not conforming to these require-

ments were considered as not verified and were excluded from further consideration. This procedure gave 890 cases available for study. An attempt was made to interview the mother of each of the malformed children, the visits being made in the summer of 1934 by three fourth-year medical students. Since approximately 80 per cent of the births took place in hospitals, these institutions were visited, and pertinent facts were extracted from their records.

In about 25 per cent of instances, the defective individual exhibited *two or more* malformations. To simplify handling, each of these persons was assigned a *single diagnosis* which represented his most serious defect.

Definite information concerning the occurrence of placenta previa was secured for 741 of the pregnancies ending in the birth of malformed individuals. The chief defect diagnoses are summarized in Table I, according to body system; those involving primarily the

TABLE I

Incidence of placenta previa in association with pregnancies ending in the birth of children with defects. The chief defect diagnosis of each abnormal individual is classified according to its location. Note that only one case of placenta previa was observed in a total of 741 pregnancies.

BODY SYSTEM	DEFECTIVE CHILDREN	PLACENTA PREVIA
Nervous	480	1
Gastrointestinal	109	0
Bones, muscles, skin	78	0
Cardiovascular	59	0
Others	15	0
Total	741	1

nervous system are subclassified in Table II. Placenta previa occurred only once in the 741 pregnancies in which malformed children were born, this instance being associated with hydrocephalus.

TABLE II

Showing association of placenta previa with pregnancies ending in birth of individuals exhibiting defects involving primarily the central nervous system. Note seriousness of malformations.

DIAGNOSIS	DEFECTIVE CHILDREN	PLACENTA PREVIA
Hydrocephalus, spina bifida	305	1
Anencephalus	94	0
Craniorrhachischisis	22	0
Undescribed monsters	20	0
Meningocele	13	0
Microcephalus	10	0
Encephalocele	8	0
Others	8	0
Total	480	1

Placenta Previa in the Population-at-Large: Among 19 opinions from current textbooks in the English language, 7 give a frequency of one

case in from 50 to 499 births, 10, one in from 500 to 1,000 births, and 2 give an incidence of one case in over 1,000 births. It is assumed that the above figures are based upon hospital statistics. J. Whitridge Williams² was under the impression that placenta previa occurs in private practice about once in every 1,000 births.

The method of locating cases of congenital malformation, i.e., from death certificates, would seem to make valid a comparison of their association with placenta previa, with the frequency of placenta previa in private practice, as given by Williams.

Although one case of placenta previa was observed in 741 pregnancies ending in the birth of malformed children, it is quite possible that no more cases would have been observed had a total of 1,000 such pregnancies been studied. On the basis of these figures, it appears that placenta previa occurred in pregnancies ending in the birth of malformed children with the same frequency as it is observed in ones which end in the birth of normally developed individuals.

B. Malformed Children Born to Women Having Placenta Previa.—The records of labors complicated by placenta previa, in 13 Philadelphia hospitals, were examined for evidence concerning malformation of the offspring. Of 433 such labors, 5 were associated with the birth of a malformed infant, or a ratio of 11 plus, per 1,000. This relationship is supported by reports from Genova,³ Lieberman,⁴ Kraul,⁵ Siegel,⁶ Kellogg⁷ and Walsh,⁸ comprising 1,264 cases of placenta previa, which included 18 instances of fetal malformation, or a ratio of 14 per 1,000.

Malformations in the Population-at-Large: Unpublished reports by Adair,⁹ and data which I¹⁰ collected indicate an incidence of approximately 5 fetal malformed individuals per 1,000 of births in the population-at-large.

DISCUSSION

The occurrence of 5 malformed individuals per 1,000 of all births, and of 11 per 1,000 of births complicated by placenta previa, suggests that some causal relation may exist between fetal malformation and placenta previa. These figures may express a relationship which is more apparent than real. For example: On the basis that 1 case of placenta previa occurs in each 1,000 births (Williams), the 433 instances of placenta previa births located in Philadelphia hospitals represent approximately 433,000 births in the population-at-large. In the latter number, there would be expected approximately 2,165 malformed offspring, based on a frequency of 5 per 1,000 births (Adair, Murphy). In this number, then, would have occurred the 5 cases of placenta previa associated with malformation found in the Philadelphia hospitals. The ratio of these 5 cases to 2,165 would be that of one case

of placenta previa to each 400 cases of malformation, as compared with one case of placenta previa for each 1,000 of births in the general population, or for each 1,000 births of congenitally malformed. The difference in these two ratios might well be accounted for by the inaccuracies attendant upon the methods used in collecting the data, and also by the small amount of data available for analysis. The impression is gained from this study, that there is no unusual frequency of association between placenta previa and congenital malformation.

The absence of any statistically significant frequency of association between placenta previa and malformation lessens the possibility that there exists any causal relationship between them, as suggested by Greenhill. This fact is further strengthened by a study of the types of malformation found associated with placenta previa.

The diagnoses of malformations associated with placenta previa listed by the authors quoted in this report, combined with those found in the individuals reported here for the first time, are given in Table III. The first six diagnoses, marked with an asterisk, and representing

TABLE III

Showing combined figures for diagnoses of congenital malformations found to be associated with placenta previa: (a) as noted by other observers and (b) as recorded by the author.

MALFORMATION	NUMBER OF INDIVIDUALS
*Hydrocephalus	12
*Anencephalus	9
*Multiple	2
*Cleft palate	1
*Spina bifida	1
*Foot defect	1
Gastroschisis	2
<i>Holoacardius eumorphus</i>	1
Torticollis	1
Iniencephalus	1
Scleroderma	1
Encephalocele	1
Cyclops	1
Fetus papyraceous	1
Erythroblastosis	1
Total	36

*Defects known to duplicate in brothers and sisters.¹¹

26 out of a possible 36 individuals, are defects which I¹¹ have found to duplicate among brothers and sisters. This familial duplication suggests that these defects are the result of factors which operate prior to the time of fertilization. If a larger number of cases had been available for study, the remaining defects might also have been found to repeat.

SUMMARY AND CONCLUSIONS

The present data indicate that there is no unusual frequency of association between placenta previa and fetal malformation. This finding,

together with a consideration of the types of malformation found in association with placenta previa, leads to the conclusion that the one condition is in no way responsible for the occurrence of the other.

The author is indebted to Dr. Carl Bachman for criticisms and suggestions.

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ACHONDROPLASIA FETALIS

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THROUGHOUT the records of ancient history one can find evidence of the existence of dwarfs. Many references are made to them in the mythologic writings of Greece. Due to their small stature, shortened limbs, and apparently normal intelligence, they were very popular with the nobles of ancient Rome who had one or more dwarfs in their retinue to serve them. Rurak²⁰ reports an eighth century basrelief of an achondroplastic dwarf which was obtained from one of the temples of Amurādhapura, in the island of Ceylon. They were not uncommon in this region and were worshiped as the god Bes, who ruled over the realm of sexual intercourse, childbirth, art, singing, and dancing. The Egyptians also set up among their many gods one called Ptah, a typical example of chondrodystrophiananism. Many of the ancient masters incorporated them in their paintings. Catherine de Medici and Empress Ann of Russia endeavored to establish a race of achondroplastic dwarfs by intermarriage, but were unsuccessful. This was due to the pelvic deformity present in the majority of these dwarfs, and the offspring could only be born by cesarean section. Today a race of dwarfs might certainly be a possibility.

Although it has been indisputably established that these achondroplastic dwarfs existed during ancient times, it was not until 1878 that Parrot¹⁵ established them as a definite clinical entity and gave them the name of "achondroplasia." Rhombert, previously in 1817, had described a human fetus with short limbs. Virchow, in 1856, attributed these cases to rickets and this added to the confusion. Parrot's description of achondroplasia was later confirmed by Porak and Durante in 1891.¹⁶ In 1893, Kaufmann¹¹ gave it the name of "chondrodystrophia fetalis," because there is "a malnutrition of the cartilage rather than an absence of the cartilage."

The etiology has not been definitely established. Various theories have been advanced. Bohn and Schwab⁴ in 1868 believed it to be due to a placental dis-

turbance. Parrot and later Kaufmann suspected a congenital malnutrition of the cartilage cells. DeBück and Mayet,⁹ in 1900, advanced the hereditary theory, and believed that the cartilage cells underwent a process of degeneration. Virchow and Grawitz thought that these were cretins due to thyroid dysfunction. Durante¹⁶ in 1900 reported a case from a syphilitic mother. Cestan and Reignault⁷ attributed it to intrauterine rickets. Jansen,¹⁰ in 1912, propounded the theory that these dwarfs were due to changes in the fetus taking place in utero between the third and sixth week, when infolding occurs. At this time he states, "the flexible scleroblastomatous skeleton begins its changes into cartilage, and is very vulnerable to changes." If the amnion is too small, due to a retardation in its growth, then there is "the direct amniotic pressure infolding the embryo, and the indirect or hydrostatic pressure in the amniotic fluid, are enhanced." Due to this, there is considerable resistance to the circulation of the blood in the amniotic sac with resulting ischemia and hunger to the fetus, and Jansen goes on to say "that the glutton among the tissues is the cartilage, and it is first and most doomed to dwarfism."

According to Crew,⁸ this is an hereditary disease. For his experimental work, he has used the Dexter, a breed of the smallest cattle in Great Britain. He showed that the "Bulldog calf," which is an abortion product of the Dexter, resembles the human achondroplastic. The histologic appearance of the shaft and epiphysis of the bones of the achondroplastic dwarf is exactly identical with that of the "Bulldog calf." He believes that the incidence of these calves is based upon a simple Mendelian dominant character, and if such individuals were mated, about 75 per cent of the offspring would be "Bulldog calves." He also suspects a malformation of the pituitary gland during the second and third month of intrauterine life as the primary cause, with resultant interference in the process of cartilage and bone formation. Crew concludes that the severity of the achondroplasia depends on the degree of malformation of the pituitary.

Keith¹² found the pituitary gland to be very small in these dwarfs. Mesz, Fliederbaum and Markieszewicz¹⁴ thought this a syndrome of anterior lobe origin. Wheeldon²⁴ in 1920 published an excellent paper on "Achondroplasia." He agrees with Jansen's theory and believes that due to the too small amnion the "head curve must needs push the region of the visceral arches and the future face against the organs of the future chest and the chest wall." In this way he explains the flattening and depression at the base of the nose and the displacement of the hard palate toward the base of the skull.

Bangson² reported chondrodystrophia fetalis through five generations and produced an interesting chart of the family tree, which proved their adherence to the Mendelian theory. Warner²³ reports a case of homologous twins in which only one is an achondroplastic and the other twin entirely normal. This seems to contradict the Mendelian law since the hereditary theory holds for homologous twins. Royer¹⁸ believes that one must consider that the etiologic factor may be due to an absence of "growth impulse." Pritchard¹⁷ reported a three-and-one-half-year-old twin that was an achondroplastic dwarf and had been treated for rickets. The other twin was perfectly normal. He believes that the etiology is based on some dominant character in the germ plasm which leads to chondrodystrophic variation connected with some defect in the endocrine hegemony. Bauer³ reported a case of unilateral achondroplasia.

REPORT OF TWO CASES

The following two cases about to be described were the only children born from these parents, and their births were separated by an interval of only one year.

Mrs. B. M. (Case 68680), aged eighteen years, married two years, menstrual history normal. Husband weighed 168 pounds, height 5 feet 7 $\frac{1}{4}$ inches. Family history: Patient's father was a very small man with a high chest. Had two normal uncles. Husband's father was also a small man. Husband's uncle was born a hunchback and died when eighteen years of age from pneumonia. Patient's long bones were normal, and measurements good. She weighed 141 pounds. Her prenatal course was uneventful. Patient entered General Hospital June 4, 1935, at 11:30 P.M. and a baby girl M(1) (Case 68684), was delivered in head presentation after a normal labor ending at 6:40 A.M. A faint fetal heart was elicited. Despite stimulants and artificial respiration, the baby died ten minutes after birth. Mother was discharged from the hospital in good condition.

External characteristics of Baby M(1) revealed large prominent frontal bones, a very narrow thorax, and short stubby extremities. Postmortem showed an achondroplastic dwarf with thickened and very small chest. The lungs were compressed and lying in a deep groove in the chest cavity. The lungs floated when immersed in water. The liver was very large and filled a greater portion of the abdominal cavity. The cause of death was due to maldevelopment characterized by a very small chest cavity, the collapsed lungs, heart, and thymus filling the lung cavity and leaving no room for the lungs to expand. Final diagnosis was "Achondroplastic dwarf with very small chest cavity. Atelectasis of the lungs."

Mrs. B. M. again became pregnant and was due to deliver in June, 1936, just one year after Baby M(1) had been born. Prenatal course was normal. Wassermann and Kahn tests were negative. Cephalic presentation. After a normal labor of twelve hours and forty minutes Baby M(2) (Case 60678) was delivered at St. Luke's Hospital at 4:32 P.M. on June 27, 1936. The baby was breathing about five times a minute with CO₂ and oxygen. Injection of alpha lobelin, warm bath, mouth to mouth breathing all failed and Baby M(2) died at 5:10 P.M.

Baby M(2) was an achondroplastic dwarf, well nourished, with pink thick skin and weighing 6 pounds 10 ounces. The face was round and flat with a cretin-like expression. The extremities were short and heavy. The hands and feet were fat and stubby. X-ray revealed both lung fields were atelectatic. Autopsy showed a very small thorax. The lungs were elongated and placed nearly entirely behind the diaphragm. Creptitation revealed a small amount of air in the alveoli. Both lungs weighed 19 gm. The liver was enlarged. Histologic examination revealed no abnormalities. Final diagnosis was "Achondroplastic dwarf with extreme deformity in the thorax. Amniotic aspiration."

DISCUSSION

There seems to be some confusion in the literature since one finds this entity confused with osteogenesis imperfecta, rickets, chondritis fetalis, dystrophie osseuse familiale, etc., but the typical achondroplastic dwarf is easily recognizable at birth. Both Babies M(1) and M(2) were characteristic types of chondrodystrophia fetalis, and presented well-defined external characteristics which were mainly as follows:

The head was larger than usual and the circumference was greatly increased. The forehead bulged and the parietal eminences were accenuated, but this was not due to hydrocephalus. The fontanelles were tense and bulging, and the sutures were widely separated. There was a depression and flattening of the bridge of the nose, giving it a pug nose appearance. The neck was short and thick and the head appeared to be set directly on the shoulders. The skin was thick, wrinkled and folded over the joints, especially that covering the arm and posterior part of the buttocks.

In both these cases, the chest cavity was much narrower than normally found, and in compressing the chest there was very little elasticity. The photographs of M(2) showed the pyramidal shape and constriction of the thorax. Jansen noted "that the chest was often shortened and consequently was too small for the proper accommodation of the vital organs. The caudal circumference was pressed inward so that the sternum was directed almost horizontally and its shape came to resemble a calotte." The mammae in M(2) were found to be located far out on the thorax just along the axilla and below the clavicle. The trunk in these cases may be longer than normally found. The musculature was extremely well developed. A very characteristic finding was the shortening and thickening of the limbs. Due to the micromelia, the manus resembled the earlier fetal conditions since the limbs were short in relation to the trunk. This shortening was more marked in the proximal part than in the distal. The limbs were curved with the convexity curved outward. In these two cases the vertebral column was not shortened, nor was there any dorsolumbar kyphos. This had been reported, and sometimes the vertebrae might be wedge-shaped. The buttocks and abdomen were prominent. The pelvis was small in relation to the rest of the body.

The hands were thick and small and the fingers were stubby. The fingers reached to the anterior superior spines. The second and third metacarpals formed an angle of about 40 degrees with one another instead of the usual 32 degrees, giving rise to the "main en trident." The feet were rotated outward. Other stigmata have been reported such as harelip, narrowed foramen magnum, umbilical hernia, etc. It is said that their sexual appetite is often enhanced.

A study of the skeleton of Baby M(2) reveals many interesting points. The head was brachycephalic, being broad, short and very long compared to the rest of the body. The sella turcica was reduced in size. The fontanels and sutures were widely open. The parietal and frontal bosses were prominent. The squamous part of the occipital bone and the nasal bone were shortened. This accounted for the depression at the root of the nose. The bridge of the nose was flattened and sunken. The cervical vertebrae were well formed. The clavicles were extremely long, measuring $4\frac{1}{2}$ cm. in length, and ossification was more advanced than normally.

The thorax was elongated, narrow, and practically incompressible and inelastic. This was probably due to the extreme ossification of the ribs. The rib cartilage was heavy, thick, and shortened. There was some broadening of the ribs in their distal ends. Both the transverse and the anteroposterior diameters of the thorax measured less than normal. In the superior mediastinum, the bodies of the thoracic vertebrae were separated from the anterior chest wall by only 4 mm. At the caudal end, the distance between the xiphoid process and the thoracic vertebrae measured 13 mm. The lungs caged in this small thorax with the heart and thymus were able to expand only to a very small degree. The central point of the skeleton was not the symphysis as is normally the case, but was now the xiphoid process. There did not seem to be any abnormality in the spinal curvature, and the vertebrae were well developed. There was a generalized shortening and broadening of the long bones of the body. The humerus measured the same length as the ulna, and the radius was 1 mm. longer than the humerus. The femur was much shortened and was only 2 mm. longer than the tibia. The pelvis was small and funnel shaped. The pelvic cavity was narrow and the ossification appeared to be farther advanced than is normally found.

Russell²¹ found that histologically the long bones showed numerous transverse without development of the longitudinal trabeculae. Instead of the normal process of calcification occurring in the cartilaginous matrix, this is replaced by mucoid degeneration. There is swelling of the cartilage cells with disturbed nutrition resulting in mucoid degeneration. Later there is a transposition of the solid matrix into a fluid consistency. This gives rise to the dis-

turbance in the epiphysis. The mucoid material is later absorbed. In some areas, calcification proceeds with resulting numerous irregular centers of calcification instead of a single center of ossification.

The changes which give rise to the characteristics of the chondrodystrophia fetalis are quite definite and were first outlined by Parrot. There is a retardation of the cartilage formation which takes place about the third week of fetal intra-uterine life, and an arresting of bone formation in the cartilage. There is a premature closing of the epiphyseal centers. The long bones, especially the humerus, and femur are mainly affected, and show marked shortening and thickening. The ulna and tibia do not show as marked changes, and these occur only where bone is replacing cartilage. Due to the excessive growth of the epiphysis, the ends of the bones have a mushroom appearance. This is due to the diaphysis, near the epiphysis, becoming cup shaped without producing any disturbance in the epiphyseal line. The flat bones derived from the membranes are not affected. The large head and bulging forehead, according to Janset, are due to a shortening of the distance of the pituitary fossa from the frontoethmoid junction and a premature tribasilar synostosis resulting in a shortening of the skull and its base and finally a depressed nasal bridge.

CONCLUSION

1. The authors present these cases as an interesting phenomenon, the occurrence of two consecutive pregnancies resulting in chondrodystrophia fetalis.

2. This is possibly further confirmatory evidence of an hereditary basis in this condition.

3. It is interesting that, in both cases, death was apparently due to the same cause; a constricted thorax and deficient chest capacity.

4. Typical cases of achondroplasia fetalis present certain well-defined characteristics which are easily recognizable at birth and should not be confused with other clinical entities.

5. An apology for the failure to study the size of the pituitary gland may be in order.

The writers wish to express their appreciation of the work of Mr. Donald Meyer, Kansas University medical student, in preparing and mounting the skeleton of Baby M(2). They wish, also, to express their appreciation for the advice and direction of Dr. Ferdinand C. Helwig, Pathologist, St. Luke's Hospital, Kansas City, Mo.

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VITAMIN B₁ DEFICIENCY AS AN ETIOLOGIC FACTOR IN PREGNANCY TOXEMIAS*

PRELIMINARY COMMUNICATION

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AT THE present time the cause of preeclampsia and eclampsia is not known. Most of the investigations¹ in this field have revealed the results and not the causes of toxemia. Titus² has found a disturbed carbohydrate metabolism, Bartholomew^{3, 4} has studied placental infarcts, Hoffbauer⁵ has found evidence of increased activity of the pituitary body, while Zangemeister,⁶ Plass,^{7, 8} Harding and Van Wyck⁹ investigated the problem of water retention. But no one has offered an adequate answer to the question: What exciting factor starts the chain of events that have been observed? A new approach to this problem is worthy of consideration.

It is to be emphasized that to find this causative factor it is necessary to search for it early in pregnancy or just when the signs of toxemia first appear, because the convulsive climax of eclampsia represents the final result of a profound disturbance.

In this preliminary communication the suggestion is offered: (1) That the pituitary body, anterior and posterior lobes, requires vitamin B₁ for its normal function. (2) That deficiency of this vitamin in the nonpregnant female causes hypofunction of the pituitary body which in turn causes the syndrome called beriberi. (3) Furthermore it is suggested that a deficiency of this vitamin B₁ during pregnancy causes a hyperfunction of the pituitary body which in turn gives rise to the manifestations of toxemia. This new concept harmonizes the findings of practically all investigators, and it may elucidate the cause of such unsolved problems as amenorrhea, hypoplasia of the uterus, hypertension, nondiabetic glycosuria, and other disorders possibly wrought through the action of the pituitary body.

During several years of practice in Canton, China, the author was impressed by the large number of patients who showed signs of clinical hypopituitary characteristics. In that same community the most common deficiency disease was beriberi or vitamin B₁ deficiency.¹⁰ Furthermore the incidence of the toxemias of late pregnancy was high.¹¹ These observations stimulated the comparisons which are given in Table I, and circumstantial support is found for the new concept of the cause of toxemia as stated above.

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TABLE I. PITUITARY FUNCTION IN PREGNANCY, PREECLAMPSIA, BERIBERI

	SIZE OF GLAND	CARBOHY- DRATE ME- TABOLISM	WATER METABO- LISM	BLOOD PRESSURE	GASTROIN- TESTINAL TRACT	EFFECT ON OVARIES
Normal pituitary ¹²	Normal	Stimulates insulin production	Regulates through kidney	Affects B. P. and capillary tone	Inhibits gastric secretion	Stimulates follicles and corpus luteum
Normal pregnancy. Physiologic hyperfunction of pituitary	Enlarged	Low sugar tolerance	Normal	Normal	Early nausea	Late months. Prolan low. Estrin high
Preeclampsia. Pathologic hyperfunction of pituitary	Enlarged	Hypoglycemia	Edema	Elevated B.P.	Nausea, vomiting	Late months. Prolan high. Estrin low
Vitamin B ₁ deficiency. Beriberi. Possible hypofunction of pituitary	Enlarged	Hyperglycemia	Edema	Lowered B.P.	Loss of appetite. Atony of gastrointestinal tract	Ovaries atrophy. Failure of ovulation

Table I indicates that the major functions of the pituitary body are probably disturbed both in the toxemias of pregnancy and beriberi or vitamin B₁ deficiency. If vitamin B₁ is essential for the normal function of the pituitary body as suggested above, then the need for this vitamin should parallel the activity of the gland. Such is the case because the pituitary body shows increased activity during growth, puberty, pregnancy, and lactation, and at exactly these periods there is an increased requirement for vitamin B₁.¹³ Thus it would be logical to treat hypopituitary disturbances with vitamin B₁ and several cases with menstrual irregularities have been submitted to injections of crystalline vitamin B₁.

One case of interest is Miss H., student, nineteen years of age, who started to menstruate at the age of twelve and one-half years. The periods were irregular, but once a month, with diminished amount of flow until 1936 when there was only spotting for about one hour. Since the age of fifteen, the patient had frequent small nasal hemorrhages just before and during her menstrual period. In September, 1936, the patient was given repeated injections of theelin together with dicalcium phosphate and iron. The period increased to twelve hours' scanty flow, but the nasal bleeding continued. Then all medication was stopped and 500 units of crystalline vitamin B₁ was injected every other day for five injections, with the result that amount of flow definitely increased and for the first time during the school year there was no nasal bleeding.

Another case illustrates a possible relationship of vitamin B₁ to the menstrual function through the pituitary body. Miss C., 19 years of age, started to menstruate at 14.5 years. Her periods were irregular, once in one or two months. The flow was copious with moderately severe cramps during the week previous to the onset of her period. At the time of examination the patient had had no menstrual

period for six months, and she had had no symptoms of cramps or soreness in the breasts. The patient was given intramuscular injections of vitamin B₁, 6.6 mg., every other day for seven doses. The day following the last injection she developed mild cramps and had a menstrual flow amounting to a large spot on the pad.

If the lack of vitamin B₁ is a fundamental cause of hypofunction of the pituitary body as mentioned above, then one would expect to find in beriberi a depression of all of the functions of this master gland and such seems to be the case. It is not necessary to discuss here the many different functions of the pituitary nor to separate the actions of the different lobes. For simplicity only five functions are given as a basis of comparison. The normal pituitary body acts as follows: (1) Insulin production is stimulated by action on the pancreas. (2) Water metabolism is regulated through the kidney. (3) Blood pressure and capillary tone are affected. (4) Gastric secretions are inhibited. (5) The ovarian follicles and corpus luteum are stimulated. Now in vitamin B₁ deficiency,¹⁴ such as is seen in beriberi, hypofunction of the pituitary might be indicated by such findings as: (1) hyperglycemia, (2) edema, (3) low blood pressure, (4) loss of appetite and atony of the gastrointestinal tract, (5) atrophy of the ovaries with failure of ovulation. Furthermore in vitamin B deficiency in test animals, the pituitary body and the adrenals are enlarged, and this increase in size may be a compensatory hypertrophy resulting from a lack of vitamin B₁.

Whereas vitamin B₁ deficiency seems to give rise to hypofunction of the pituitary body in the nonpregnant patient, a similar deficiency during pregnancy may cause a hyperfunction of the pituitary which in turn produces the syndrome of eclampsia and preeclampsia. Evidence of hyperfunction of the pituitary body in pregnancy toxemias is shown by such findings as: (1) Disturbed carbohydrate metabolism, (2) edema, (3) elevated blood pressure, (4) nausea and vomiting, (5) prolan^{15, 16} in the blood and urine is high and the estrin is low. Furthermore Cushing^{17, 18} has found a basophilic invasion of the posterior lobe of the pituitary body, and he advances evidence that the degree of this basophilia represents a measure of neurohypophysial activation. In view of the toxic symptoms of preeclampsia and eclampsia, the term pituitary toxicosis might be used just as thyrotoxicosis is used to connote hyperthyroidism. The author suggests that vitamin B₁ is necessary for normal pituitary function just as iodine is necessary for the thyroid function. Thus the enlarged pituitary body as seen in vitamin B₁ deficiency would correspond to the enlarged thyroid gland (colloid goiter) due to iodine deficiency. Also as an adequate supply of iodine prevents colloid goiter, and furthermore can allay the toxic symptoms of hyperthyroidism, just so may sufficient vitamin B₁ prevent the enlargement and underfunctioning of the pituitary in the nonpregnant

patient on the one hand, while on the other hand this same vitamin may allay the symptoms of malignant hyperactivity of this gland as seen in the toxemias of pregnancy.

With the onset of pregnancy, the pituitary body enlarges and meets the increased demands with increased function. It is suggested here that this increase in function can proceed normally only if there is an adequate increased supply of vitamin B₁. During pregnancy the requirement for vitamin B₁ is increased 3 to 5 times. Therefore, if the expectant mother does not increase her intake of this vitamin accordingly, she may unwittingly forge the first link in the chain that may bind her fast to a later toxemia. Thus the cause of toxemia probably operates early in pregnancy and is not to be found at the time of an eclamptic convulsion. It may seem paradoxical to suggest that a deficiency of vitamin B₁ in the nonpregnant female causes hypopituitarism, while in the pregnant patient that same deficiency causes a hyperfunction of the same gland. However, it may be that the onset of pregnancy produces such changes in the maternal organism that the pituitary body not only compensates for a lack of vitamin B₁ but actually overcompensates to the detriment of the patient. Why then do beriberi and neuritis occur in the pregnant state?^{19, 20} Why do not these manifestations of vitamin B₁ deficiency always give rise to preeclampsia and eclampsia? It is possible that a deficiency of vitamin B₁, which is present for some time before the onset of pregnancy, may so impair the function of the pituitary body that the additional burden of a gestation makes the vitamin deficiency so severe that the gland is unable to compensate, and neuritis and beriberi result just as in the nonpregnant patient. If the deficiency of this vitamin occurs only after onset of pregnancy, then the pituitary seems capable of overcompensating, thus producing a toxemia.

In searching for the fundamental etiologic agent in the pregnancy toxemias, the following questions must be answered. Why is toxemia more common in: (1) primiparae, (2) multiple pregnancies and hydatid mole, (3) among the poorer patients, (4) and why does toxemia so often disappear after delivery of the fetus? The new concept offered in this report gives a probable explanation for all of the questions raised above: (1) the pituitary body of the primipara is smaller than that of the multipara, so that the glands adjustment to insufficient vitamin B₁ in the organism is likely more difficult and limited and thus toxemia makes its appearance more frequently in such cases. (2) In multiple pregnancies the requirement for vitamin B₁ is increased still more than the usual increased demand for a single pregnancy, so that the mother is likely to take a relatively insufficient amount of this vitamin, thus causing toxemia more frequently. In the case of hydatid mole, the rapid cellular growth is brought about perhaps by the hyperfunction of the pituitary body, and this hyperfunc-

tion demands more vitamin B₁, so that a relative lack could arise and this again produce changes leading to frequent toxemia. (3) Toxemia is more prevalent among the poorer patients, because their supply of vitamin B₁ may be scarcely enough for the nonpregnant state and the increased demands for this vitamin during pregnancy are not met and toxemia results. Prenatal care with the usual attention to diet increases the intake of vitamin B₁ and thus toxemia is prevented. The poor patient cannot afford fresh fruit and vegetables in the winter months when the prices rise, so the intake of vitamin B₁ is relatively less and toxemia in pregnancy increases. (4) Delivery often relieves the symptoms of toxemia because the demand for hyperfunction of the pituitary body, with its demand for more vitamin B₁, is taken away and the amount of vitamin B₁ available more nearly meets the needs for normal pituitary function. Vitamin B₁ is stored in the body only to a limited extent, so that a constant supply is necessary if a deficiency is to be avoided.

The practical application of the foregoing hypothesis is now possible with the availability of crystalline vitamin B₁²¹ for parenteral administration. Studies are now under way at Maternity Hospital, Cleveland, under Dr. Sidney Stone; and Pittsburgh, under Dr. Paul Titus; in Philadelphia by Dr. Clifford B. Lull and Dr. Philip F. Williams; in Chicago by Dr. D. S. Hillis, and in Atlanta by Dr. R. A. Bartholomew. It is hoped that further interest and cooperation will be stimulated.

SUMMARY

A new approach to the problem of the cause of preeclampsia and eclampsia is presented based on the suggestion that:

1. The normal function of the pituitary body is possible only when an adequate supply of vitamin B₁ is available.

2. Vitamin B₁ may be necessary for the pituitary as iodine is for the thyroid gland.

3. In the nonpregnant female a deficiency of vitamin B₁ leads to beriberi, the symptoms of which are produced by hypofunction of the pituitary body. The symptoms of beriberi include disturbed carbohydrate metabolism, edema, low blood pressure, atrophy of the ovaries, atony of the gastrointestinal tract.

4. In the pregnant female, this deficiency of vitamin B₁ results in overcompensation or malignant hyperfunction of the pituitary body thus producing the symptoms of toxemia, for example, disturbed carbohydrate metabolism, edema, elevated blood pressure, nausea and vomiting, increase in prolactin, and decrease in estrin in the blood.

5. An adequate and constant supply of vitamin B₁ should prevent toxemia and perhaps cure it.

6. This new concept harmonizes for the first time practically all of the conflicting findings and confusing manifestations of toxemia.

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DISGERMINOMA OVARIUM*

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INTRODUCTION

THE ovary, because of errors in its embryologic development, is frequently the seat of rests, the potentialities of which are great and varied. If indeed the ovary has been compared to the fertile garden wherein bloom the rarest of growths, then too it has equally proved a jousting ground. Here the variant views as to the histogenesis of these very neoplasms forever clash, one gaining fleeting preeminence over the other. The variant tumors have truly been the enigma of both gynecologist and pathologist for their nature and origin have been the occasion of endless and bitter discussion. The *bête noire*, particularly of this group, is the disgerminoma. Until recent years it has been the source of considerable confusion. This has been due, not so much to failure of recognition, for its morphologic characteristics are comparatively uniform, but rather to the profusion of names to designate one and the same neoplasm. It appears that the "seminome" of the French, the "grosszellige karcinom" of the Germans and the many tumors described by English, American, and other authors as round cell sarcoma; embryonal, alveolar cell and solid carcinoma, mesothelioma, endothelioma, etc., fall into the category termed by Robert Meyer¹ as disgerminomas.

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EMBRYOLOGIC CONSIDERATIONS

In the embryonal growth of the gonad, unused mesenchymal germinal cells may remain because of developmental errors. These cell rests may later proliferate and manifest themselves in several ways.

a. If the rests are misplaced very early, at the time of asexual embryonal growth of the gonad when the mesenchyme is undifferentiated, undetermined and neutral, they may later give rise to tumors of ovary, testis or hermaphroditic gonad. These embryonal rests retain all their fetal qualities, i.e., the proliferative potencies and the asexual neutral character. These germinal cells are neither male nor female nor hermaphroditic, but are pathologically neutrally determined mesenchymal cells which are embryonally undifferentiated, inferior, disgerminal, hence disgerminomas.

In the further development of the gonad differentiation of the mesenchyme occurs² either (1) in the male direction into "Sertoli cells" influenced chromosomatically and by the invading spermatogonia; (2) in the female direction into "granulosa cells" influenced chromosomatically and by the invading ovula.

b. If at this period by some process of malformation mesenchymal rests determined in the male direction are formed in the parenchyma of a gonad otherwise determined in the female line, then these may later arise in the ovary with prospective potentialities to form germinal cords or testicular channels. These cells are masculinizing in their effect and hence are called arrhenoblastomas.

c. Mesenchymal cell rests of female determination may be left in a gonad maturing in the female direction. These rests may then give rise to neoplasms of the ovary in which the cells follow their original inherent tendencies and hence develop into granulosa cell tumors.

The foregoing embryologic considerations conform with the views held by Meyer, Fischel, Schiller in Europe, Novak and Gray³ in America. They have been slightly modified from the stand taken by these authors in order to explain more readily the unusual incidence and clinical features of the neoplasm under discussion.

RELATIONSHIP BETWEEN DISGERMINOMA OVARIUM AND SEMINOMA TESTIS

The disgerminoma differs from the other growths in its congeneric group, i.e., the granulosa cell tumors and the arrhenoblastomas in that it occurs in both the female and male gonads. Its occurrence in the testis was described in 1898 by Chevassu who called this tumor a "seminoma." Some thirteen years later tumors of similar stamp occurring in the ovary were noted by Chenot⁴ who labelled them "seminoma ovarii." However, since the tumors do not masculinize the female nor effeminize the male, nor hyperfeminize or hypermasculinize, it is evident they are neutral. Robert Meyer after studying a series of these cases in the female rejected the term seminoma because they did not masculinize. The error in designating these tumors of the testis as seminomas arose through faulty interpretation of the histologic findings. The seminiferous tubules present in sections of so-called seminomas of the testes are not the product of the tumor, but merely mute evidence of the normal tissue structures overrun by large protoplasmic-rich neoplastic cells thought to be spermatoblasts.

The origin of these growths is from early undifferentiated germinal cells in the embryonal gonad which never attained a specific power to sex direction. Therefore identical disgerminal pathologic structures may develop in both types of sex glands. For this very reason the term disgerminoma should be employed. It is descriptive and serves to indi-



Fig. 1.—Case 1. Showing the lobulated appearance of the tumor. Note the small involuted uterus.

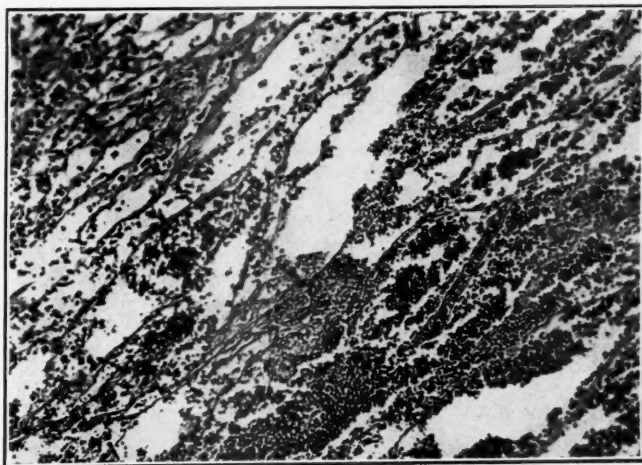


Fig. 2.—Case 1. Showing the alveolar arrangement and distribution of cells, as well as the loose edematous stroma.

cate its origin as well as its place in the lineal scale of related tumors arising from germinal cell rests.

The following brief outlines of cases are placed on record to add to the growing list of reported disgerminomas. An analysis of such reports should prove useful in the final summation of the clinical and pathologic behavior of this group.

REPORT OF CASES

CASE 1.—A well-developed and nourished negress, aged thirty-four, and mother of two children, entered the University Hospital Apr. 10, 1923, complaining of pain and fullness in the lower abdomen. She gave a history of gradual enlargement of the abdomen for the past year. About the same time she noted a change in her menses from a regular and normal flow to a very painful and scanty catamenia. For

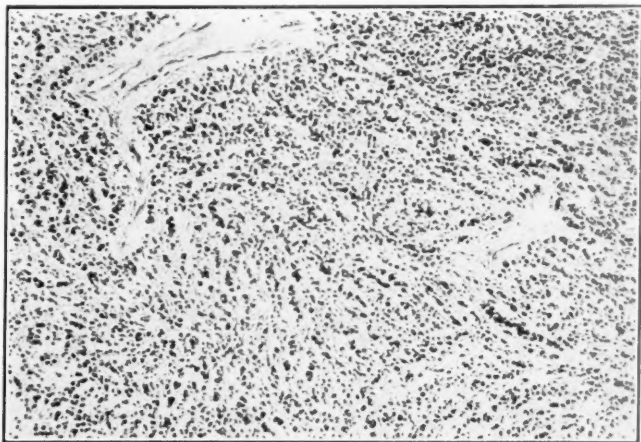


Fig. 3.—Case 1. Showing the cordlike arrangement of the cells and the scantiness of the stroma.

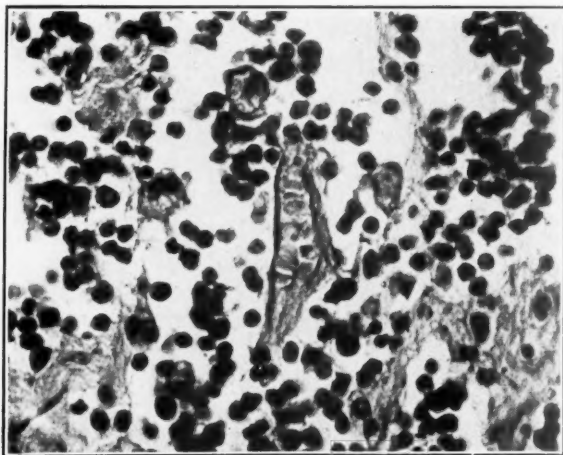


Fig. 4.—Case 1. Showing the cells with large hyperchromatic vesicular nuclei and scanty cytoplasm lying loosely apart and unsupported by a connective tissue framework.

two weeks prior to her admission she experienced fever and night sweats. Physical examination revealed an irregularly distended abdomen. Palpable through the abdominal wall was a large irregular mass which filled the abdomen up to the costal notch. Pelvic examination disclosed a parous outlet, a serosanguineous discharge from a lacerated cervical os, and a very small uterus behind the pubic arch.

Pathologic Report.—(a) Solid ovarian carcinoma (reclassified dysgerminoma). (b) Hyperinvolution of uterus.

Postoperative Course.—Radiation therapy was given to the pelvis. Patient left the hospital in fairly good condition. She was readmitted two months later with generalized carcinomatosis and died with clinical evidence of cerebral metastases.

CASE 2.—An unmarried white female, aged thirty-five, was admitted in June, 1925, to the Edgecombe Hospital, Tarboro, N. C., with a history of a tumor palpable through the abdominal wall. A laparotomy was performed and a right ovarian tumor the size of a grapefruit was removed along with a small fibromyoma of the uterus. Specimens were sent to the Department of Pathology, University of Georgia, for examination.

Pathologic Report.—(a) Solid carcinoma of the ovary (reclassified dysgerminoma).
(b) Fibromyoma of the uterus.

The patient recovered from the operation and was soon married. Six months later, however, she was again hospitalized and a second laparotomy revealed a



Fig. 5.—Case 4. Showing the sectioned appearance of an area of the dysgerminoma undergoing necrosis with cavitation and hemorrhage.

malignant growth of left ovary adherent to adjacent structures and extending into the ileum. Removal of the ovary and resection of the small intestine were performed and the specimens again sent to us for study.

Pathologic Report.—(a) Solid carcinoma of the ovary (reclassified dysgerminoma).
(b) Secondary metastases to intestine.

CASE 3.—A young negress, aged twelve, was admitted to the Aiken Hospital, Aiken, S. C., Oct. 21, 1931, with acute abdominal distention, fever, nausea and vomiting. A history was obtained that three months had elapsed since her first and only menstrual period. Ten days prior to admission she was first seen by her physician who made the following note. "She was in a semi-conscious condition. The abdomen was distended and rigid. The pelvic examination was unsatisfactory but masses in both adnexa could be palpated. The white blood cell count was 20,000. Pulse was rapid and temperature was 100° F. She was apparently very toxic." She died one day following admission and permission for an autopsy limited to the pelvis was obtained. "Bilateral solid ovarian tumors each measuring

10 cm. in diameter were found. No other tissues were involved but there was some gland enlargement." The specimens were sent for study to the Department of Pathology, University of Georgia.

Pathologic Report.—Bilateral malignant tumors of the ovary; mesothelioma (reclassified dysgerminoma).

CASE 4.—A young white female, aged twenty-one, was admitted to the Oglethorpe Private Infirmary, Macon, Georgia, December, 1936, with nausea and vomiting of ten days' duration and abdominal swelling for the past three weeks. She was married one year ago, has never been pregnant and gave a history of normal menses except for the last period which was eight days late. Physical examination revealed essentially female development with normal genitalia and no evidence of masculine stigmata.

Operative Note.—Laparotomy revealed a growth the size of a small grapefruit arising from left ovary, with extensive invasion and spread into the retroperitoneal

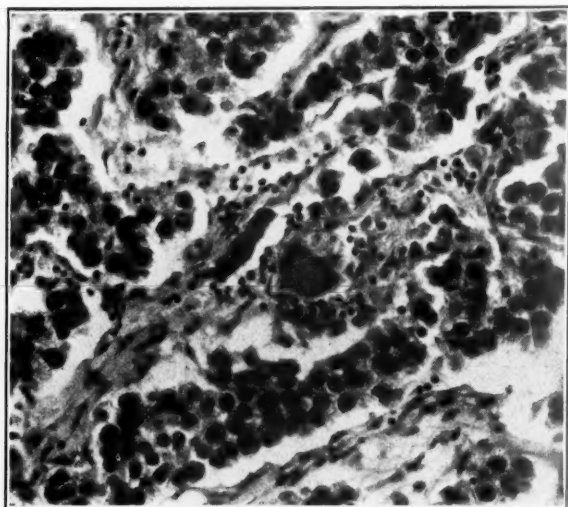


Fig. 6.—Case 5. Showing the pseudotubercle with the giant cell. This is an occasional feature observed in dysgerminomas. Note the characteristic cellular arrangement and the lymphocytic infiltration of the connective tissue stroma.

tissues and involvement of the mesentery. The growth was soft and friable and infiltrated. As much of the primary and metastatic growths were removed as was possible. The specimens were sent to the Department of Pathology, University of Georgia, for histologic study.

Pathologic Report.—Dysgerminoma (malignant). A course of radiation therapy was suggested.

CASE 5.—A young white female, aged twenty-one, married two months, was admitted to the Washington General Hospital, Washington, Georgia. She first noted pain in her right lower quadrant six months ago. Lately there had been a gradual increase in size of the abdomen. Her menstrual periods had been regular until two months ago, since which time she had not menstruated. It was observed that the breasts were fairly well developed, but there was a masculine distribution of the pubic hair. At laparotomy two large ovarian masses, measuring 20 cm. and 15 cm. in diameter, respectively, were removed. The uterus appeared small and

infantile. Extension of the growth into the retroperitoneal structures was noted. Several pieces of this neoplastic tissue were excised at operation. This material was sent to the Department of Pathology, University of Georgia, for study.

Pathologic Report.—Bilateral disgerminoma with invasion and extension.

ANALYSIS OF CASES

The age incidence in this series is characteristic. It is a tumor of the young woman as is indicated by the ages, twelve, twenty-one, twenty-one, thirty-four, thirty-five. In three of our patients it was unilateral, in one, however, the other ovary was later involved. In two the newgrowth was bilateral. The rapidity of growth of the tumors can be judged from the relatively short duration of symptoms. The menstrual cycle appeared to be disturbed once the tumor had developed to any size.

In Case 1, the mother of two children and married seventeen years, there was a sudden change from a normal and regular menstrual cycle to a very scanty and painful one for a period of one year before operation. In this patient the uterus (Fig. 1) was markedly hyperinvolved as to suggest a reversion to infantilism. Various authors have stressed the point that the disgerminoma in some manner retards development and is responsible for female hypoplasia. Of the five cases reported by Meigs,⁵ one case was that of a female aged twenty-five who had never menstruated and had marked genital and breast infantilism. In Frankl's⁶ two cases, one patient had a normal uterus, the other a rudimentary one. A large proportion of disgerminomas, however, fully 35 of 64 tabulated by Fauvet, have occurred in individuals with presumably normal sex development.

One salient feature of our small series is that none of the neoplasms were benign. One died with generalized metastases in spite of radiation therapy, another had metastases to the other ovary and small intestine, a third was bilateral with presumable regional lymph node metastases, and a fourth and fifth had extensive retroperitoneal invasion. This tumor is apparently frequently malignant even when unilateral. This point is at variance with other investigators (Meigs and Schiller). Schiller emphatically states that most of the unilateral disgerminomas are benign and exhorts us not to perform total extirpation in young women who hope for subsequent childbirth, nor to add radiation therapy with resulting castration of the patient. He advises radical measures only when a definitely positive diagnosis of malignancy can be made, not microscopically, but clinically by secondary deposits on the serosal surface of the uterus, peritoneum or the presence of ascites.

Béclère⁷ states that this neoplasm is characterized by its extreme radiosensitivity and advises the administration of deeply penetrating well-filtered x-rays projected at a distance and given in fractional doses over a prolonged period. In Meigs' series one patient who had peritoneal metastases died one and one-half months following radiation therapy. He nevertheless concludes: "this tumor which looks very malignant is apparently not severely so, as of five cases that have come to our attention, four are alive and well over four years."

SURGICAL PATHOLOGY OF DISGERMINOMA

A. Grossly the disgerminoma appears as encapsulated or circumscribed lobulated tumors of variable size with a characteristic doughy consistency. They may be freely movable in the pelvis or may be densely adherent to adjacent structures as a result of local extension

and invasion. These neoplasms are as frequently bilateral as unilateral. The sectioned surface presents a smooth, solid, homogeneous pale brain-like appearance. The tissue is very soft and friable. Hemorrhagic and yellowish discolored areas of degeneration and necrosis are frequently present.

B. Histologic study reveals a uniform picture of large cells with vesicular hyperchromatic round nuclei. The cytoplasm is scanty and is faintly stained. Mitotic figures are frequently seen. The cells are arranged discretely in small alveoli, in narrow cords of cells or lie loosely apart in a very fine and scant stroma. Trabeculas of loose edematous, poorly vascularized connective tissue are to be seen. These are often diffusely infiltrated with small lymphocytes. This lymphocytic infiltration is characteristic but is not always noted. Occasional giant cells and large macrophages filled with cellular debris, lipid globules, fragmented nuclear material are found. For detail study frozen sections are preferable since the tissue shrinks considerably with paraffin embedding. Sudan stains reveal occasional lipid filled cells.

C. Clinically these tumors grow rapidly and may reach a large size within a period of two to three months distending the abdomen. When degeneration occurs, fever, nausea, and vomiting with abdominal pain may become prominent symptoms. Changes in the menstrual cycle such as oligomenorrhea and dysmenorrhea, or amenorrhea may be present. Marked breast hypoplasia, infantile uterus and undeveloped external genitalia are commonly seen. Asthenic, sexually neuter females as well as hermaphrodites often harbor this tumor.

SUMMARY

Many ovarian neoplasms formerly designated alveolar large cell carcinoma, round cell sarcoma, seminoma ovarii, embryonal carcinoma, etc., fall into one classification, i.e., the disgerminomas. These neoplasms are peculiar to young women, the ages of the five patients herein recorded are twelve, twenty-one, twenty-one, thirty-four, and thirty-five. The disgerminoma arises from cell rests misplaced at the time of asexual embryonal growth of the gonad when the mesenchyme is undifferentiated and neutral. Hence this tumor may have its counterpart in the testis as well as in the hermaphroditic gonad. The disgerminomas do not exert any hormonal influence, however stigmas of hypoplasia and infantilism are frequently observed in patients harboring such neoplasms.

The surgical pathology of this neoplasm is distinctive. They occur bilaterally as frequently as unilaterally and appear as solid encapsulated or circumscribed lobulated tumors which have a peculiar doughy consistency. Sectioned surfaces are smooth, soft, friable, and have the characteristic appearance of brainlike substance. Microscopically round cells with large deeply staining nuclei and clear cytoplasm lie discretely

apart in a scanty avascular stroma. Connective tissue trabeculas diffusely infiltrated with lymphocytes irregularly lobulate the neoplasm. However, this lymphoid feature may be lacking.

The unilateral tumors are said to be benign, nevertheless the three unilateral cases in this series proved to be malignant.

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THE CONSTRUCTION OF AN ARTIFICIAL VAGINA BY THE TUBE GRAFT METHOD*

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THE problem of the formation of an artificial vagina has been attacked in the past most often by the relatively dangerous methods of intestinal resection, employing either the small bowel (Baldwin-Gersuny) or the operation of Popow-Schubert using the resected portion of the lower rectum as the vagina. These operations naturally carry a relatively high mortality rate and in spite of the fact that they are best adapted to the treatment of this anatomic anomaly, the tendency more recently has been for gynecologists to attempt some form of plastic transplantation of skin flaps (Graves, Davis, Cron, Grad, Frank, and others).

The use of pedunculated skin flaps with immediate transplantation was employed successfully by us in one case reported in 1934. This patient has since married and has satisfactory coitus. Complete epithelization of the reconstructed vaginal vault, however, was difficult to achieve and the final length of the vagina after the period of complete healing had taken place was slightly less than three inches due to contraction.

In a second case performed by the same technique the lower flaps from the inner aspects of the thighs did not take and were lost almost completely in the resultant slough.

With this in mind it seemed advisable to attempt the procedure reported by Frank and Geist in 1927 with the report of additional cases in 1932. The principal objection to this procedure is that it necessi-

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tates multiple operative procedures. It is emphasized by Frank and Geist that the construction of an artificial vagina is justified only in patients either married, planning to be married, or in single individuals with strong sex impulse.

The present case occurred in an attractive patient of definite feminine appearance, distribution of hair, with fairly typical external genitalia and complete absence of vagina. Upon rectal examination no pelvic structures were palpated which suggested the existence of a uterus or of gonads. This patient had normal feminine psychologic outlook and libido. She had apparently normal excitability centered in the clitoris and in the neighboring erogenous zones. There was a small dimple at the site of the normal vagina. This patient had a



Fig. 1.—Appearance of vagina after failure of first operation by the Graves method, i.e., flap transplantation, employing labia minora and full thickness skin grafts from internal aspects of the thigh.

doubtful history of menstrual molimina and some indefinite bleeding from the rectum on two separate occasions. She was well nourished, having normal distribution of hair, and was normally feminine in contour and habitus. The clitoris was normal in appearance, labia minora small, and the urethral orifice large.

OPERATION

Operation was attempted by the Graves technique, four flaps being made from the labia minora, their twofold thickness being split, and two racket-shaped flaps from the inner aspect of the thigh, used for the upper and lower transplants, respectively. Transverse incision was made in the perineum, approximately $1\frac{1}{2}$ inches above the rectum. Rectal examination revealed nothing palpable suggesting ovary

or uterus. With a sound in the bladder and the index finger of the left hand in the rectum, careful dissection was made between the rectum and bladder admitting two fingers to a point as far distal as could be reached with the middle finger, carefully avoiding injury to the rectum or bladder. Several fairly large vessels were encountered, which necessitated suture.

The previously described flaps were sutured in place according to the method described by Graves and Pemberton.

The postoperative course was uneventful but the grafts did not take well. The lower pair were almost completely lost by slough.

The patient was readmitted to the hospital Jan. 27, 1935 approximately three months later. At this time in spite of numerous attempts at dilatations, the vagina was found to be markedly contracted, admitting only one finger to a point $1\frac{1}{2}$ inches from the introitus where there was a stricture. This dilated fairly readily and the vagina was found to be three inches in length with a diameter of only about 2 cm.

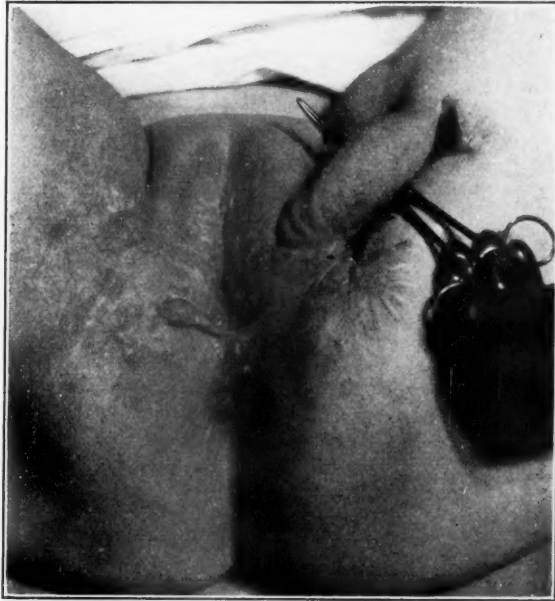


Fig. 2.—Tubular graft (satchel handle) showing distal attachment almost separated.

This patient was examined again two months later when it was found that due to scar tissue contraction, the operation had practically been a complete failure (Fig. 1).

On May 7 the patient was readmitted to the hospital, and it was decided to attempt the Frank and Geist method. This was reported in 1927 and 1932 with five cases wherein by successive steps a tubular flap is made which is then undermined, eventually inverted and implanted as a pedicle graft. The disadvantage of the method is the long period of hospitalization and the dilatation which must be scrupulously followed afterwards but the operation offers a better chance of success.

SECOND OPERATION

On May 7, 1935 examination revealed a small opening at the vaginal site merely admitting one finger to the knuckle with marked scar tissue. On the left medial aspect of the thigh a full-thickness skin flap was undermined, beginning at a point approximately one inch from the labia minora, seven inches long, three inches wide

and was left attached at both ends. The cut edges were sutured allowing the skin surface to remain outside, employing interrupted silk sutures. The defect on the thigh was approximated with stay sutures of silkworm gut, and the skin edges were closed with interrupted silk sutures. This defect healed satisfactorily (Fig. 2).

Two weeks later under gas anesthesia the distal attachment of the flap was detached further, approximately 50 per cent of the distal attachment being severed. The patient was discharged on May 29, 1935. Approximately six weeks later the patient was readmitted and the flap almost completely severed from its distal attachment. The skin was carefully prepared, and its bacterial flora reduced so far as possible by moist packs of phenylmercuric nitrate solution.

THIRD OPERATION

Examination of the outlet revealed the scars of previous plastic repair. The vaginal orifice was extremely small, admitting the index finger only up to the knuckle. The urethral orifice was approximately normal. A transverse incision was made in the perineum and with a sound in the bladder, the index finger of the left hand in the rectum, the rectovaginal septum was dissected. This was performed with some difficulty as the rectum and bladder were in extremely close approximation. There was very little bleeding. Dissection was carried out rapidly, only one large blood vessel being encountered on the left side of the vesicorectal septum. The "satchel handle" flap on the inner aspect of the left thigh was excised from its distal attachment and was cut along the original line of suture. This was inverted, turning "the skin side inside," the fat trimmed off, and it was sutured with interrupted fine catgut sutures about a rectal speculum, three inches in length, equipped with a phalange at its external end. Two sutures of No. 2 chromic catgut were brought through the length of the speculum through the apex of the sutured flap and one long suture beneath to aid drainage. The edges of the vaginal flap were approximated to the skin margins as uniformly as possible. The rectal speculum was held in place by guide strings of cable silk. A Pezzer catheter was placed in the bladder.

Eight days later when the speculum was removed, the grafts had taken and there was some slight sloughing immediately at the margin of the skin edge in the vagina. The retention catheter was removed on the tenth day. Saline douches were commenced on the tenth day. Discharge was rather marked. The patient was allowed out of bed on the fifteenth day, and external appearance of the vagina was quite good. The vagina admitted the index finger full length. Examination revealed the entire graft had taken, but there was a granulating area, at the apex of the new vagina. The patient was discharged and instructed to come in every two weeks for examination and manual dilatation.

The patient was examined and the vagina digitally dilated approximately every two weeks during the succeeding year. The scars of the previous plastic operation showed marked softening and the skin was in very good condition. Approximately six months after operation it was necessary to make a small incision in an annular contraction about the orifice most marked where the tubular flap had entered the vagina. The incision was made approximately an inch in the vagina into the scar tissue. Bleeding was slight.

This patient was followed carefully and was examined bimonthly during the succeeding seven months. There was a tendency toward contraction of the granulating area and foreshortening of the vagina at the end. This, however, did not become serious. At her final examination, July 1, 1936, the vagina was approximately three inches in length, soft, pliable, free from tenderness. It was fully epithelized, free from hair and marked scarring (Figs. 3 and 4).



Fig. 3.—Pelvic examination, nine months after marriage, showing vagina approximately about three inches in length, admitting two fingers, in an ordinary pelvic examination.



Fig. 4.—External appearance of vagina nine months after marriage.

This patient has since married and normal coitus mutually satisfactory has been possible. The vagina is completely epithelized. The patient has experienced normal orgasm.

This method apparently stands a better chance of being successful than any method of immediate transplantation at a single stage and offers a better probability of resulting in a relatively deep pliable vagina which may be functionally adequate.

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RESULTS OF SKIN TESTS FOR PREGNANCY

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IN 1930 Porges and Pollatschek¹ suggested the utilization of the chorionic (anterior pituitary-like) hormone as a skin test for pregnancy. They reasoned that an intradermal injection of a small amount of this hormone should not give a skin reaction if a like hormone were present in the body. Hence, there would be no skin reaction in the presence of pregnancy because of the abundance of chorionic hormone in the system at that time. A negative skin reaction, therefore, would signify a positive test for pregnancy. They obtained correct reactions in 71.5 per cent of 90 pregnancies and 95.4 per cent of 150 nonpregnant patients.

Gruskin,² using his own hormonal preparation, reported correct reactions in 100 per cent of 158 pregnant, and 90 per cent of 39 nonpregnant, patients. Gilfillen and Gregg,³ using antuitrin-S, reported a series of 154 obstetric and gynecologic patients in whom the test was correct in every instance. Schwartz,⁴ who used antigen supplied by Gruskin, reported a group of 221 patients in whom the test was correct in 96 per cent of 155 pregnant women and 90 per cent of 66 nonpregnant women. He used 16 males as controls, in whom he obtained 100 per cent correct reactions. Schwartz stressed the importance of the pseudopodia rather than the presence of an erythema in positive reactions.

We have employed the intradermal test for pregnancy in 211 patients, 157 of whom were known to be pregnant. The technique followed by us was essentially that described by Gilfillen and Gregg.³

TECHNIQUE

Two minims of antuitrin-S are slowly injected with a tuberculin syringe into the skin of the flexor surface of the forearm. The resulting wheal should be round and have the appearance of pigskin. The reaction is read at fifteen-minute intervals. An area of erythema varying in size up to 35 or 40 mm. with the formation of pseudopodia indicates that no chorionic hormone is present in the patient and the reaction therefore is negative for pregnancy. If, on the other hand, no local reaction occurs, it indicates the neutralizing effect of chorionic hormone and therefore the test is positive for pregnancy.

Table I shows our results.

TABLE I

CLINICAL DIAGNOSIS	NEGATIVE FOR PREGNANCY	POSITIVE FOR PREGNANCY	TOTAL
Pregnancy	45	112	157
Pelvic inflammatory disease	14	0	14
Pyelitis	4	0	4
Normal female	4	0	4
Normal male	5	2	7
Fibromyoma	3	2	5
Carcinoma of cervix	1	2	3
Abortion, spontaneous	1	2	3
Abortion, incomplete	2	1	3
Nephritis and pregnancy	1	0	1
Chronic cervicitis	1	0	1
Ectopic pregnancy	2	2	4
Hyperplasia of endometrium	2	0	2
Postpartum, day V	2	1	3
Totals	87	124	211

Occasional latent skin reactions were observed. They are not of importance as far as the immediate reading of the test is concerned, and probably are not significant. We noted this latent reaction in 18 of the pregnant patients, one of whom developed a marked induration and erythema as late as twenty-four hours after the injection.

Since the commercial preparation of Antuitrin-S supposedly contains the same hormone as anterior pituitary liquid (Collip),* we were interested to learn if the latter could be used for this test. We therefore tested 80 known pregnancy patients with intradermal injections of 0.1 c.c. The resulting reactions were 100 per cent incorrect, and considerable soreness was produced locally. Presumably, anterior pituitary luteum does not contain any estrin, but since we obtained such a marked skin reaction we wondered whether it might be due to the presence of a small fraction of this ovarian hormone. Therefore, we selected 48 patients known to be pregnant and gave each an intradermal injection of 0.1 c.c. aqueous theelin and a similar amount of Antuitrin-S at different localities in the arm. Theelin gave as marked a dermal reaction as anterior pituitary luteum, but the local erythema and induration disappeared more rapidly, so that a skin reaction was present at the end of one hour in only 14 patients. The reaction was positive for pregnancy

*Anterior pituitary liquid kindly supplied by Messrs. Ayerst, McKenna and Harrison.

in 26 and negative for pregnancy in 22 of these patients, which constitutes a markedly lower percentage of correct reactions than we obtained when antuitrin-S was used alone. It therefore is possible that the reaction to antuitrin-S was influenced by theelin.

The results of the various investigators are given in Table II.

TABLE II

	PREGNANT		NONPREGNANT	
	PER CENT CORRECT	PER CENT INCORRECT	PER CENT CORRECT	PER CENT INCORRECT
Porges and Pollatschek	71.5	28.5	95.4	4.6
Gruskin	100.0	----	97.0	3.0
Gilfillen and Gregg	100.0	----	100.0	----
Schwartz	96.0	4.0	90.0	10.0
Hoffmann and Fouch	71.0	29.0	80.0	20.0

Our results tally more closely with those of the original investigators than with those of the American observers. We have no explanation to offer, but since we adhered strictly to details of the technique described and have been critical in the interpretation of skin reactions obtained we feel that our results are correct. Judging from our own experience, we feel that the intradermal injection of antuitrin-S as a test for pregnancy is not yet of such reliability that it can be recommended for replacement of the accepted biologic tests.

SUMMARY

1. Antuitrin-S given intradermally to 211 patients gave 71 per cent correct reactions in 157 known pregnancies and 80 per cent correct reactions in 54 nonpregnant patients.

2. Anterior pituitary liquid (Collip) gave 100 per cent incorrect skin reactions in 80 pregnant patients.

3. Antuitrin-S and theelin given simultaneously to 48 pregnant patients resulted in 54 per cent correct and 46 per cent incorrect reactions.

We wish to express our appreciation to Dr. Ludwig A. Emge for his assistance in the preparation of this paper.

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Weinzierl, E.: Experiences With the Natural Birth Control of Knaus, Med. Klin. 33: 962, 1937.

Weinzierl was at first skeptical of Knaus' contentions but he is now a firm believer of the Knaus theory of the safe period. He has observed a large number of couples who have successfully conducted their sex life according to the Knaus theory.

J. P. GREENHILL.

DESCRIPTION OF A NEW METHOD OF STUDYING PLACENTATION BY AMNIOTIC SAC DISTENTION

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IF CARE is exercised in delivering the placenta it is possible to obtain the placenta and fetal membranes quite intact so that the sac is complete with the exception of the opening over the cervical area through which the fetus emerged at birth.

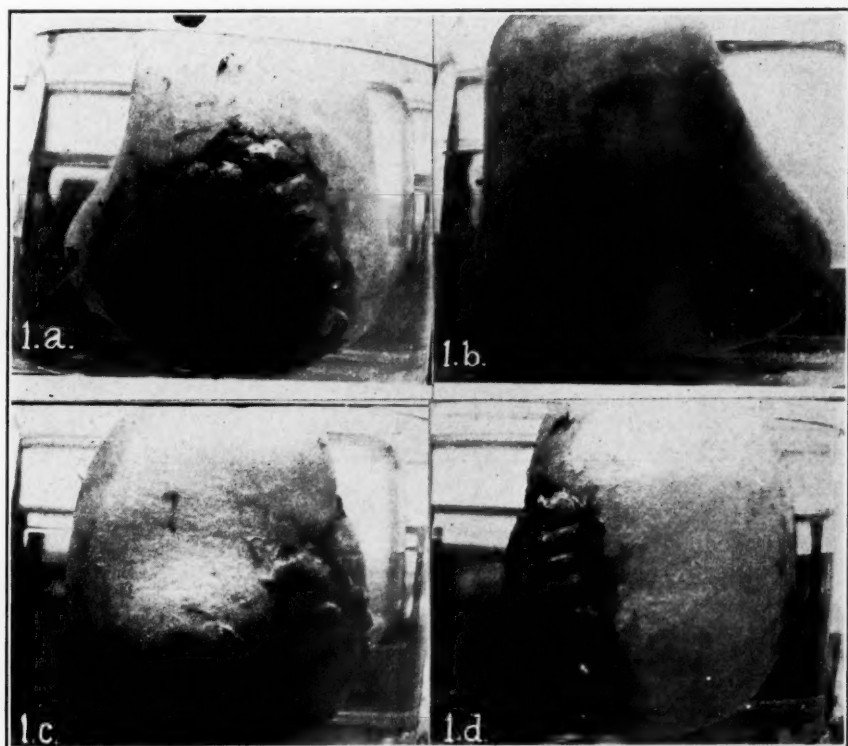


Fig. 1.—Four photographs of the same full-term sac in a glass jar of water showing (a) placenta located on one anterior or posterior wall between the two cornual bulges, (b) reverse face, (c) lateral view of the surface with the more prominent bulge, (d) opposite lateral view.

Now by the simple procedure of submerging this sac in a tank of water up to the cervical rupture and then introducing into the cavity of the sac a known quantity of water to fill and distend it to its capacity, it is found that the sac assumes the exact shape of the distended uterus from which it came. The sac takes on a rough pyriform shape and most

remarkable of all, in most cases it develops more or less pointed bulges opposite each other at the widest part and farthest from the cervical tear (see Fig. 1, *a, b, c, d*). Without a doubt these correspond to the areas over which the tubes arise. This assumption is furthered by the fact that several unopened pregnant uteri, hardened in formalin, when bisected revealed the identical bulges over these areas (Fig. 2).

The average full-term sac is found to hold between three and five liters of fluid; a twin pregnancy sac held almost seven liters, and several cases of polyhydramnios, an equal amount.

From a study of the distended sacs directly and from clay models of a hundred of them, it is seen that the most common placenta is more or less circular and lies between the uterine cornua and on the relatively flat anterior or posterior wall. It seldom extends over the dividing line

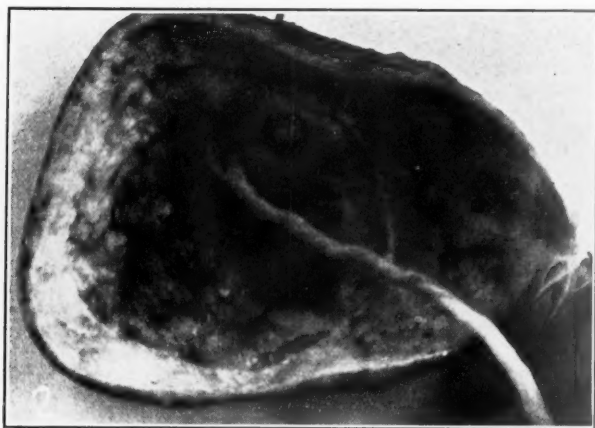


Fig. 2.—Photograph of placental half of five months' pregnant uterus containing fetus and unruptured amniotic sac and hardened in formalin before bisecting along lateral surface. Placenta here lies between the bulging cornual areas.

between anterior and posterior walls either at the side or over the apex of the fundus and when it does, it is most likely to be bipartita or succenturiata or placenta spuria.

This method is ideal for the study of abortion sacs and often reveals the cause of the termination of pregnancy otherwise unsuspected. It shows a definite tendency for early placentas to be relatively larger in area than at full term, and from few cases so far studied a tendency to atypical location of implantation in the uterus, i.e., cornual or cervical rather than in the anterior or posterior wall which are relatively flat and probably contain the best decidua for implantation and subsequent nourishment of the ovum.

This method is of value in the study of placenta previa and reveals it to be more common than clinically diagnosed. However a check of the history of labor usually reveals vaginal bleeding prior to delivery.

Not enough cases of placenta circumvallata have been found to make any definite statements in regard to their location but, from the cases recorded, this method in the future should be of greatest value in elucidating this remarkable condition.

If the obstetrician will mark with a dye the anterior portion of the sac as it emerges from the vagina, he will be able to further localize the placenta in the uterus as to anterior and posterior wall.



Fig. 3.—Photograph of three months' abortion sac showing the cervical and two cornual defects in the decidual covering of the distended sac.

The pressure of the fluid in the sac may be varied from 1 cm. to 20 cm. of water without causing noticeable volumetric changes in the sac. Consequently fairly accurate studies may be made in regard to the relation of area of placenta to area of uterine cavity.

A perusal of the literature reveals no mention of such a method of study.

Oyrrun, Romeo Cadiz: A Case of True Hermaphroditism (Ovary-Testes) in the Human, Bol. Soc. Chilena de obst. y ginec (Buenos Aires) 1: 117, 1936.

A case of true hermaphroditism with ovotestes is presented. The patient dying of pulmonary tuberculosis was studied postmortem and autopsy material established the diagnosis. The patient had a typical masculine voice, and well-developed breasts. The genitals revealed feminine distribution of hair, a hypospadiac penis and a small vagina. The patient had an attraction for the female sex but had been intersexual.

MARIO A. CASTALLO.

OBSERVATIONS ON THE EFFECTS OF URETHANE AND BARBITURATES ON SMOOTH MUSCLE

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TO RELIEVE the pain of childbearing without delaying the progress of labor is one of the commonest problems of the anesthetist and a constant one for the obstetrician. The barbiturates have come into rather general use as sedatives, analgesics and pre-anesthetics. Repeated clinical observations have indicated that Dial (di-allyl-barbituric acid) not only seemed not to slow down labor, but actually seemed to hasten the process.¹⁻⁴ Dial, as commercially available, comes in an ampule containing 4 times as much urethane (ethyl carbamide) as di-allyl-barbituric acid. The urethane is included for the sake of increasing the solubility. It seemed possible that the urethane might have altered or contributed to the action of the mixture. External hysterographic studies were undertaken, are still in progress, and will be reported later.*

In the meantime a certain amount of purely laboratory investigation of the action of urethane on smooth muscle has been done. For a comparative working basis such experiments are indicated, with all respect for the recognized differences between isolated smooth muscle tissue in an artificial bath and the human parturient uterus. In clinical labor the state of the central nervous system, the ability to cooperate, the help of voluntary abdominal muscles, and, especially, the highly active physiologic state of the uterine muscle itself are all powerful factors. Nevertheless, the direct action of drugs concerned on smooth muscle must be the starting point for comparative study.

There is a general impression among physiologists and other laboratory workers that urethane, in animal experiments, interferes less with normal reflex responses than do any of the other common anesthetics.

Previous reports⁵ have indicated that isolated intestinal segments were relaxed only by concentrations as high as 1:200 to 1:100. Repeated checking in this laboratory has found the concentration of urethane necessary for depression of uterine or intestinal muscle to be about 1:150. Since the usually employed clinical dose of dial represents roughly a urethane concentration of 1:5,000, muscle depression by the urethane component would not be expected. Di-allyl-barbituric acid alone has about the same smooth muscle depressing power as has amytal (iso-amyl-ethyl-barbituric acid); i.e., 1:40,000 or greater concentration is necessary

*Suggestion of the problem and guidance of the work, of which this report is a part, was given by Professor Graffagnino of the Department of Gynecology of this institution.

for relaxation.⁶ The usual dial dose is approximately equivalent to a concentration in the blood stream of 1:22,500, well within the depressing range. There must, however, be some reason for the "clinical impression" that delivery is hastened by its use.

Attempting analysis, about 30 experiments have been done on isolated rabbit intestine and guinea pig uterus, using sodium amytal alone and sodium amytal plus 400 per cent urethane in concentrations ranging from minimal effective to virtually paralytic.

In no instance was there any indication that the added urethane contributed in any way, in either direction, to the effect of the amytal.

Comparison of some accepted approximate figures: if urethane depresses smooth muscle at a concentration of 1:150, and amytal depresses smooth muscle at 1:40,000, the ratio of smooth muscle depression is 1:266. With 4 times as much urethane as amytal in the mixture, there is attributable to the urethane component an extra 1.5 per cent muscle depression. Calculated roughly from effective dog doses, amytal is 30 times as anesthetic as urethane. With 4 times as much urethane as amytal, the urethane component adds an extra 13 per cent to the anesthetic power of the combination.

It should further be remembered that delivery may be accelerated clinically by relaxation of the cervix, despite a certain amount of possible potential smooth muscle depression.

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The author found that in a series of 159 women operated upon for appendicitis, 68 per cent were operated upon during the premenstrual and postmenstrual periods, 17 per cent during actual menstruation and only 15 per cent at other times during the menstrual cycle. He believes that the hyperemia which occurs during the premenstrual period and actual menstruation can imitate the symptoms of appendicitis. He is of the opinion that the hyperemia of the appendix is due to the corpus luteum hormone. He observed cases in which dysmenorrhea disappeared after appendectomy.

J. P. GREENHILL.

CHEMICAL TEST FOR THE DETERMINATION OF RUPTURED MEMBRANES

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RECENTLY there has been considerable interest in the establishment of accurate tests for the determination or confirmation of rupture of the amniotic sac. Several investigators have succeeded in evolving tests which are apparently sufficiently accurate to be of value.

The tests have been based on the fundamental facts that normally the hydrogen ion concentration (pH) of the vaginal secretion ranges around 4.5 to 5.5 and the pH of the amniotic fluid is usually 7.0 to 7.5.

On the assumption that the pH of the vaginal secretion will change when it is contaminated with the escaping amniotic fluid following rupture of the membranes, the determination of the hydrogen ion concentration of the vaginal secretion would seem, therefore, to be an index to the status of the amniotic sac relevant to continuity.

Recently, there has been marketed an indicator test paper* impregnated with sodium dinitro phenylozonaphthol disulphonate, commercially known as nitrazine paper. With these papers is furnished a color chart comprising a pH range from 4.5 to 7.5. The papers are set at pH of 6.0. These indicator papers were intended for use primarily to determine the reaction of urine.

In view of the fact that the nitrazine papers with the accompanying color chart comprise a pH range sufficient to cover both the pH of the vaginal secretion and that of the amniotic fluid, it seemed appropriate to use this method for the determination of the status of the amniotic sac. Consequently, this method was tried on a small number of patients admitted to the Baltimore City Hospital with a history of premature rupture of the membranes. Those cases which revealed the reaction of the vaginal secretion to be at a pH of 6.0 or above were found, by their subsequent course, to have given a correct history of ruptured membranes. Those cases in which the pH of the vaginal secretion was below 6.0 were found, by the same criteria, to have submitted a false history of ruptured membranes. The test seemed to have possibilities and it was planned to run a series of consecutive cases to control and confirm the accuracy of the method.

TECHNIQUE

Fifty patients, consecutively admitted to the delivery suite of the Baltimore City Hospital, were used in this series. The pH of the vaginal secretion was determined by inserting a sterile cotton-tipped applicator deeply into the vagina, and after withdrawal, the cotton tip was touched to a strip of the nitrazine paper and the paper then compared with the color chart. If, during the course of labor in the first stage room, the membranes ruptured spontaneously, the test was repeated. If the membranes ruptured when the patient was draped on the delivery table, the test was not repeated.

*Made by E. R. Squibb and Sons Company, New York.

RESULTS

In the series of 50 consecutive cases that were studied 11 of these patients were admitted with a history of ruptured membranes, and 39 gave a negative history on this point. Table I shows the results obtained with the test in the 39 cases of unruptured membranes. In 26 of these cases the pH of the vaginal secretion was 4.5. In 9 others it was 5.0 and in the remaining 4 it was found to be 5.5. Fourteen of these 39 patients had a spontaneous rupture of the membranes after admission while still in the first stage, and the test was repeated. Following the rupture in 3 cases the vaginal secretion revealed a pH of 7.0, and in 11 it was 7.5. The remaining 25 of the 39 cases were not tested because the membranes were ruptured at delivery.

TABLE I

PATIENTS ADMITTED WITH HISTORY OF UNRUPTURED MEMBRANES IN EARLY FIRST STAGE LABOR. 39 CASES

	ON ADMISSION		AFTER MEMBRANES RUPTURED		RUPTURE ON DELIVERY TABLE
	pH	CASES	pH	CASES	NOT TESTED
	4.5	26	7.0	3	25
	5.0	9	7.5	11	
	5.5	4			
Total		39		14	

In Table II, the data are recorded on the 11 patients who were admitted with a history of ruptured membranes. In this group some were in early labor and others were not in labor. A record was kept of the time elapsing between the rupture of the membrane and the time at which the test was done. It will be seen from the table that the shortest interval was fifteen minutes and the longest nineteen hours. One of these patients first tested after an interval of nineteen hours had a very protracted labor and was tested again when the interval had reached twenty-nine hours, and the pH at this time was 6.0. The patient was delivered shortly thereafter.

TABLE II

PATIENTS ADMITTED WITH HISTORY OF RUPTURED MEMBRANES (INCLUDING THOSE IN LABOR AND THOSE NOT IN LABOR). 11 CASES

TIME ELAPSED BETWEEN RUPTURE AND TEST	pH
15 minutes	7.0
45 minutes	7.5
1½ hours	7.0
1½ hours	7.5
2 hours	6.0
6 hours	7.5
6½ hours	7.0
8 hours	7.0
12 hours	7.0
19 hours	7.0
*19 hours	7.0

*This patient was tested again twenty-nine hours after membrane rupture (still undelivered) and the pH was found to be 6.0.

The one enlightening fact relevant to the possibility of a false reading was brought out in 3 of the patients who went through labor with the membranes intact until delivery. These 3 cases showed the expected acid reaction on admission, but the reaction changed to an alkaline one (6.5, 7.0, and 7.5, respectively) in the latter

part of the first stage of labor, when each of the patients was having a rather unusually large amount of bloody show. However, at this stage of labor the question of the status of the amniotic sac is not such an important one as a rule, and, moreover, at this stage the cervix is usually sufficiently dilated so that the question can be settled by the examining rectal finger.

With the technique as described above, it would seem that the possibility of a false reading because of contamination by urine is negligible. The deep insertion of the cotton-tipped applicator into the vagina should insure against this.

It is the policy in this clinic to shorten the interval between the premature rupture of the amniotic sac and delivery of the patient as much as possible. By this it is meant that a patient who presents herself with what we feel is an assured history of ruptured membranes is given a medical induction. This policy is based on the belief that the shortest interval between the membrane rupture and delivery serves the best interests of the patient. In those patients, who present themselves and "think" their membranes have ruptured without labor pains, and in whom it is found that the cervix is closed, it would seem that this test is of great value.

SUMMARY

1. The determination of the pH of the vaginal secretion may be used as a test for the determination of the rupture of the amniotic sac.
2. A simple technique has been evolved by using nitrazine test papers by which this determination may be accomplished satisfactorily.
3. A pH of 6.0 or above indicates ruptured membranes. A pH below 6.0 indicates unruptured membranes.
4. A false reading is likely to be encountered in a patient with intact membranes who has an unusually large amount of bloody show. In the early stages of labor, however, at a time at which the test is of most value, it is accurate.
5. The test lends itself ideally in those patients who present themselves with a history of possible rupture of the membranes, not in labor, in whom the usual clinical examination is not adequate to confirm the history.

CARCINOMA IN AN ADENOMYOMA OF THE UTERUS

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ACCORDING to Ewing,¹ leiomyomata of the uterus are the most common of all tumors; adenomyomata of the uterus are relatively rare. Malignant changes in these tumors seldom occur. Indeed, up to 1929, only 26 such cases have been reported,² and none since. Of these, 19 showed carcinomatous, 5 sarcomatous, and 2 both types of changes. Metastases to distant organs occurred in 5 instances. The following is a report of an adenomyoma with carcinomatous change in a uterus which was removed at operation. The patient subsequently made an uneventful recovery.

Clinical History.—M. J., a forty-year-old white woman, was admitted to The Jewish Hospital of Brooklyn on the service of Dr. E. V. Littauer, on Jan. 14, 1937, complaining of severe pelvic pain radiating to the thigh, associated with excessive bleeding at the menstrual periods for the past two months. She stated that for the past eight years she had dysmenorrhea; her periods were irregular and were associated with excessive bleeding and with occasional back pains radiating to the thigh. There was an occasional leucorrhea. She had had no menopausal symptoms.

On admission, the physical examination was essentially negative, except for marked pallor of the lips and mucous membrane. The red blood cells were 3,100,000 per c.mm.; the hemoglobin was 45 per cent. The clinical impression was that she had a fibroma of the uterus and polyglandular dysfunction. On the day following admission, a transfusion of 750 c.c. of whole blood was given. At operation on January 18, the uterus was found enlarged to the size of a three months' gestation by



Fig. 1.—Photograph of the cut surface of the uterus showing the well circumscribed tumor.



Fig. 2.—Photomicrograph of a portion of the adenomyoma uninvolved by carcinoma. (H. & E. $\times 15$.)

a fibroid. Both ovaries contained numerous small cysts; the tubes appeared normal. A supracervical hysterectomy and a bilateral salpingo-oophorectomy were performed by Dr. E. V. Littauer.

The specimen consisted of an ovoid-shaped uterus with attached tubes and ovaries. The uterus measured 14 by 11 by 9 cm. The external surface was smooth and glistening. The uterine cavity was 9 cm. long. The endometrium was pale and shaggy and not well demarcated from the myometrium. In the cut surface the

myometrium measured 1.5 cm. in thickness and was pale brown. In the opposite wall there was a nodule which was circumscribed by a narrow rim of pale brown myometrium. It was uniform and was composed of pearly gray-white interlacing bundles. In it were pinpoint depressions with pouting borders from which exuded some mucoid material. Both Fallopian tubes measured 8 by 0.5 cm. The fimbriated extremities were patent. The cut surfaces were not unusual. The right ovary

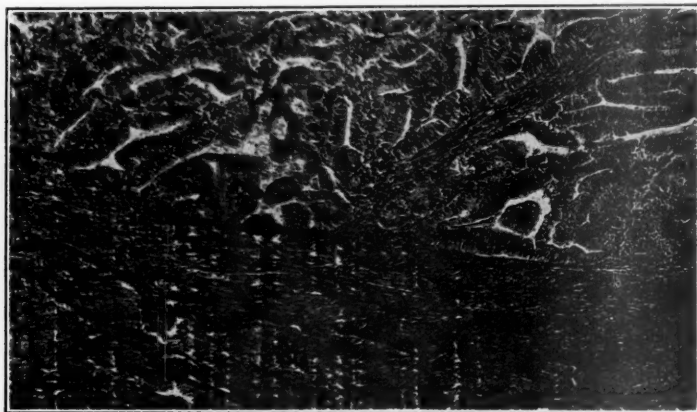


Fig. 3.—Photomicrograph of the wall of the uterus showing some overgrowth of the endometrium but no tumor involvement of the myometrium. (H. & E. $\times 45$.)

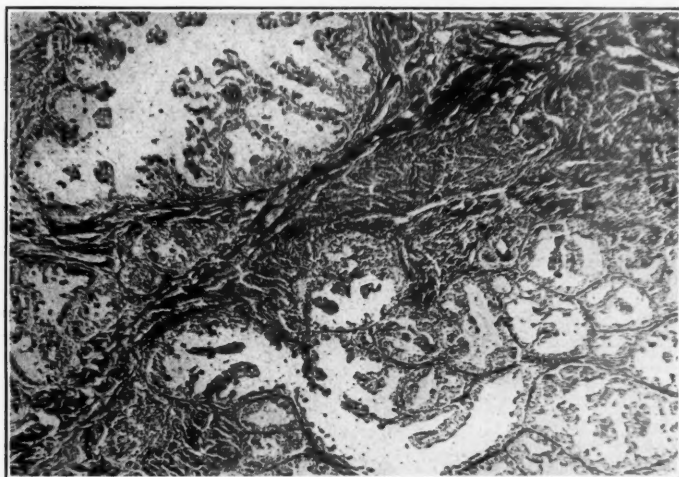


Fig. 4.—Photomicrograph of the tumor in the adenomyoma showing the general nature of the growth. (H. & E. $\times 45$.)

measured 5 by 4 by 1.5 cm., the left, 4 by 2.5 by 2 cm. Both contained numerous thin-walled cysts, up to 1 cm. in diameter.

A microscopic preparation through the wall of the uterus showed at one end a broad endometrium with many large tortuous glands in a loose tunica propria. The lining cells were columnar and varied somewhat in size and shape; in places they were heaped up into several rows. The lumina contained amorphous lavender staining material. There was no invasion of the myometrium. In the preparations through the tumor, there were zones composed of interlacing bundles of smooth

muscle cells in whorl-like arrangements; in some of these areas there were lumina empty or containing amorphous lavender staining material which were lined by columnar cells. In other zones imbedded in a dense fibromuscular stroma, were large irregular lumina with frequent infoldings and secondary papillary projections. The lining cells varied in size, shape, and chromatin content of their nuclei. Many were in a state of mitotic division. The lumina contained amorphous pink or lavender staining material. Preparations from the ovaries and tubes showed nothing unusual.

The pathologic diagnosis was "uterus, with cylindrical cell carcinoma, arising in an adenomyoma; Fallopian tubes and ovaries."

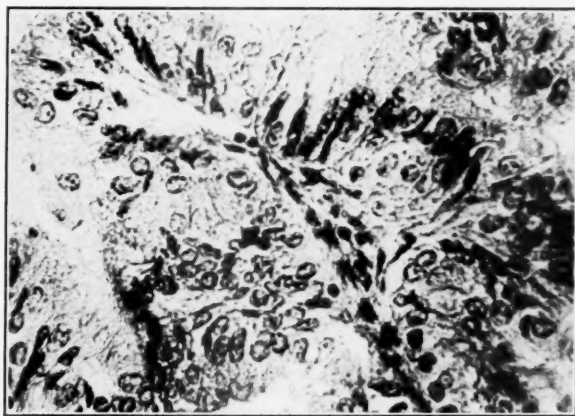


Fig. 5.—A higher magnification showing the type of cell making up the tumor. (H. & E. $\times 600$.)

Comment.—There are two possible interpretations in this case. It is either a carcinoma of the uterus with extension into a leiomyoma, or a carcinoma arising in an adenomyoma of the uterus. Of the two, the latter appears to be the more probable for the following reasons: In the first place, a carcinoma of the uterus which extended into a leiomyoma on one side should also have involved the opposite wall. Second, there are within the tumor nodule, zones composed of loose fibrous connective tissue resembling the tunica propria of the endometrium, in which well preserved lumina are seen containing some lavender staining, amorphous material, and lined by tall columnar cells.

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The author reports a case of congenital imperforated vagina, unrecognized for thirty months following the initial menstrual period. He describes the resulting changes of the internal genitalia and the final spontaneous rupture of the vagina into the peritoneal cavity.

AUGUST F. DARO.

THE DIAGNOSIS OF TRICHOMONAS VAGINALIS*

A COMPARISON OF A CULTURAL METHOD WITH DIRECT EXAMINATION OF WET PREPARATIONS

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A NUMBER of authors have reported that protozoan parasites can be found more frequently if certain cultural methods are used than when direct examination is made of the material. Nevertheless, it has been noted previously³ that in the case of parasitic amebas, direct examination of the feces yields a larger number of positive findings than do cultural methods, and that all the problems of species identification pertain to amebas in cultures that attend the determination of species found on direct examination, and often some additional problems.

In a number of papers the culturing of material in which flagellates are suspected of being present has been advocated and claims are made that the cultural method reveals more positive findings than the direct method of examination.

With regard to *Trichomonas vaginalis*, Andrews¹ reported that "five of twenty positive cases did not show the presence of *Trichomonas vaginalis* either in the direct smears or the stained films, but in cultures a heavy growth occurred." She considered asparagine medium and agar-slope and serum-saline-citrate solution the best mediums. Karnaky² has advocated the cultural method for diagnosis of *Trichomonas vaginalis* and has reported having difficulty with distinguishing these parasites from pus cells when direct examination is made. He used "Hill's medium" which actually is Hogue's medium and stated that more positive results could be found by the cultural method than by direct examination.

In order to test the relative merits of these two methods, 250 consecutive examinations were made for the presence of *Trichomonas vaginalis*, using a cultural method and direct examination. Hogue's medium was first tried in a preliminary run of fifty cases, but the medium proved unsatisfactory both from the standpoint of manufacture and of revealing growth. The medium recommended by Powell⁴ was then used and it proved highly satisfactory.† The medium used must be considered satisfactory since luxuriant growths were obtained in nearly all instances and each time the parasite was found by smears, some degree of growth resulted except once.

*Submitted for publication, April 22, 1937.

†Loeffler's dried blood serum is weighed out in quantities weighing 0.06 gm., which are then put in ordinary 5 gr. (0.3 gm.) gelatin capsules. Modified Ringer's solution is then made up by dissolving 6.0 gm. of sodium chloride, 0.1 gm. of potassium chloride, 0.1 gm. of calcium chloride, and 0.1 gm. of sodium bicarbonate in 1000 c.c. of distilled water. Twice or thrice a week, as the medium was required in this study, 25 c.c. of this Ringer's solution was measured out and the contents of one of the gelatin capsules was added to it. When the Loeffler's serum was dissolved, 0.5 c.c. of fresh, Wassermann-negative human serum was added. Ordinary test tubes of 15 c.c. capacity, plugged with cotton, were used as culture tubes. About one loopful of rice starch was placed in the bottom of each tube and 6 to 8 c.c. of the liquid medium was then poured over it. It was not found necessary to sterilize this medium. No adjustment of pH was necessary, the pH, as determined colorimetrically with bromthymol blue, being approximately 6.8.

The method of collecting the specimens in order to make the two methods comparable was to insert two sterile cotton swabs into the vagina and rotate them several times. One was then shaken off in a drop of physiologic salt solution on a slide, and a cover glass was applied. Search was made under a magnification of 100 diameters for from one to three minutes. Higher magnification was used for verification. The other swab was plunged into a tube of medium and the tube, with its swab, incubated for twenty-four hours, after which time wet preparations on slides were made and examined. The maximal growth was usually seen in twenty-four hours but occasionally not until forty-eight hours. The cultures were not held longer. Of the 250 females examined, 52 (20.8 per cent) proved to harbor *Trichomonas vaginalis* and of these cases, in 51 the parasite was found by the cultural method and in 51 by the direct smear method; one instance being missed by each method (Table I).

TABLE I. COMPARISON BETWEEN CULTURAL METHOD AND DIRECT EXAMINATION OF FRESH VAGINAL SECRETION FOR THE PRESENCE OF TRICHOMONAS VAGINALIS

SMEARS		CULTURES	
POSITIVE	NEGATIVE	POSITIVE	NEGATIVE
51	199	51	199

It can be seen from the results that the cultural method possesses no advantage over a careful direct examination of vaginal secretion. Even if both methods are used on each specimen only an occasional additional positive finding will result, not enough to justify the additional time and expense involved in the cultural method. It is important that the examiner use low power magnification and that he be familiar with normal and pathologic vaginal secretions and, what is most important, that he be able to recognize the species *Trichomonas vaginalis*.

CONCLUSION

If fresh wet preparations of vaginal secretion are competently examined on slides, results will be satisfactory. By use of a cultural method the number of positive findings will not be sufficiently increased to justify adoption of such a procedure. Either method, in competent hands, should yield approximately the same results; the direct examination will be cheaper, less laborious and will yield results twenty-four hours sooner than the use of cultures.

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DERMOID CYST OF OVARY IN A CHILD FIVE YEARS OLD, WITH COMMENTS ON VALUE OF X-RAY IN THE DIAGNOSIS

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A REVIEW of the literature reveals that ovarian tumors are rare in children under ten years of age. They are still less frequent in children under five years old. Wiel¹ studied 60 cases in children of ten years up to 1904. Dermoid cysts were present in 21 cases, or 35 per cent. A further analysis of his investigation revealed 7 patients under five years of age; these cases had a mortality of 65.1 per cent. Downes² reviewed 26 cases of ovarian tumors from 1904 to 1921 in the same age group, of which 8 cases were dermoids. Further study revealed only 2 cases, five years or under. In Loeb and Levy's³ analysis of 35 cases from 1921 to 1931, there were 9 cases of teratoid tumors. Only 3 patients were under five years of age. Wakeley⁴ in 1933 reported 3 patients under 10 years of age, but none five years or under. He studied the records for twenty-five years of the Hospital for Sick Children, Kings College Hospital, and the Belgrave Hospital for Children, and found one case each in the latter hospitals, but no case in the first. Apparently, dermoids in children under five years of age are extremely rare. It is our purpose to report the occurrence of a dermoid cyst of the ovary in a child five years old, and to emphasize the value of the Roentgen ray in the diagnosis of a dermoid cyst of the ovary.

CASE REPORT

R. R., female, five years of age, was admitted to St. Peter's Hospital on Aug. 13, 1936. She had no family history of malignant disease. Both of her parents had always been in good health. She had scarlet fever at nine months, pneumonia with empyema at three years of age, pertussis two months prior to admission with no complications. The present illness at this admission revealed pain in the lower abdomen near the midline with no associated nausea or vomiting.

Physical examination showed a young white female poorly nourished, anemic, but not acutely ill. Teeth in rather poor condition. Tonsils enlarged and injected. Cervical glands on both sides were enlarged. Heart and lungs were grossly negative. Inspection of the lower abdomen presented a pyriform appearance with suppression of respiratory movements. The percussion note revealed tympany over the epigastrium and splenic flexure, likewise over hepatic flexure; dullness to flatness over both lower flanks with the suggestion of a fluid wave in lower abdomen. No venous enlargement was present in the abdominal wall. On palpation a tumor mass was felt which was semisolid, mobile, globular, nodular, insensitive, and did not seem to be adherent to the anterior wall. This tumor mass seemed to have its origin in the right side connected by a pedicle and freely mobile. It was 7 by 8 cm. in diameter. There were no nodular masses palpable throughout the remaining abdomen.

Roentgen ray of the abdomen revealed an oval-shaped tumor measuring about 8 cm. in diameter in the right side of the abdomen extending from the lower liver edge downward to below the iliac crest. There appeared to be plaques of calcification in this tumor mass. The calcified area is irregularly branched with areas of density somewhat suggestive of bone and rudimentary teeth development.

The preoperative diagnosis was right dermoid cyst.

The operation was under ether anesthesia. The abdomen was opened through a midline incision, about 4 inches long. A tumor about 7 by 8 cm. in diameter was delivered. The tumor was found to be a right-sided tumor of the ovary twisted on its pedicle. It was globular, semicystic and contained calcified material. On the

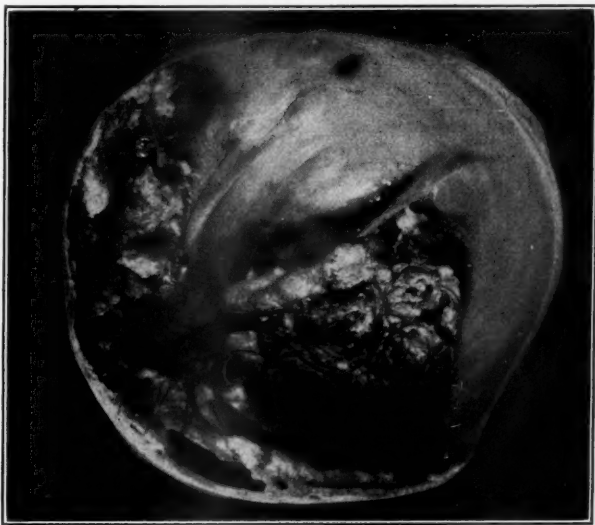


Fig. 1.—Illustrates the tumor opened with fluid contents removed. Cholesterol substance, hair, rudimentary maxilla, and teeth are shown.

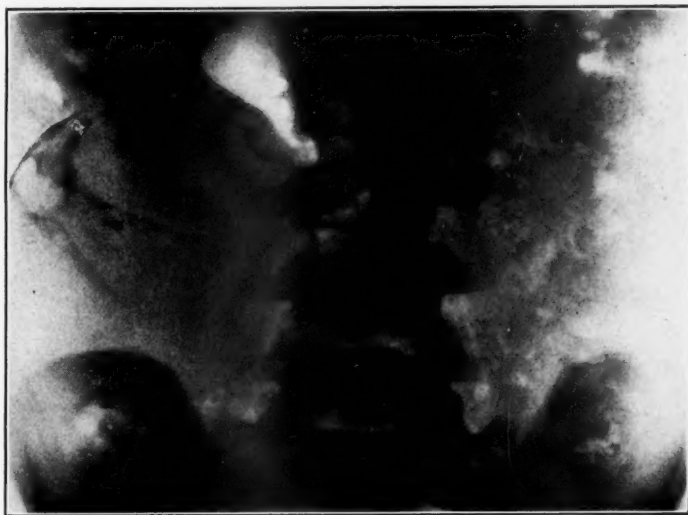


Fig. 2.—Roentgenogram of tumor before operation. Opaque substance containing rudimentary mandible and teeth can be outlined.

surface, there appeared some tissue resembling ovary. The pedicle was long and about 2.5 cm. wide, coming from the right broad ligament. The uterus was small and normal. The left tube and ovary were normal. The tumor was removed together with the right tube which was very much flattened out over the superior surface of the cyst (Fig. 1).

Pathologic Report.—The ovary showed a large cyst approximately 8 cm. in diameter, one section of this cystic mass showing dense tissue with calcification. This was proximal to fimbriated extremity and represented residual ovary. Mass was translucent and showed smaller cystic areas within the surface capsule. The cyst contained considerable amount of cholesterol deposit and hair. Section of the wall showed dense connective tissue. In one section there was a structure closely simulating chorion stratified squamous epithelium and sweat glands.

The child made an uneventful recovery, and was discharged from the hospital on the fourteenth day. The child has been seen on several occasions since discharge and is in apparently the best of health.



Fig. 3.—Roentgenogram of tumor after removal. Opaque substance containing rudimentary mandible and teeth can be outlined.

In the above case, the preoperative diagnosis of a dermoid cyst was made and subsequently confirmed at operation by a roentgenogram of the abdomen, which clearly showed a rudimentary mandible with teeth (Fig. 2). A roentgenogram of the tumor was taken after extirpation which showed the same elements (Fig. 3).

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133 CLINTON STREET
38 LIVINGSTON STREET

HEMATOSALPINX DUE TO TORSION OF A HYDROSALPINX

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TWISTING of the pedicle of a hydrosalpinx causing hematosalpinx and gangrene is uncommon. The following case report of its occurrence in a woman weighing at least 350 pounds, who made an uneventful recovery after operation, seems worthy of record.

There were 35 authentic cases of this condition reported prior to 1900.^{1, 2} Anspach³ tabulated 62 instances of torsion of hydrosalpinx among 87 cases of torsion of tubal enlargement that he reviewed in 1912. Eastman² revised this number to 65, added 3 of his own, and collected an estimated total of 91 cases before 1927. Since that time there have been reported 12 instances of this complication.⁴⁻¹⁵ These, plus the case we report, make a total of at least 104 cases to this date. The figure given is low, as without much question there have been numerous single cases unreported.

Mrs. M. B., aged forty-seven years, was admitted to the Surgical Service of Michael Reese Hospital at 1:00 P.M. on July 6, 1935. Three days previously she began to have dull right lower quadrant abdominal pain, radiating around to the back and down to the symphysis pubis. This remained constant until the evening of July 5, when it became much more severe and intermittent. She became nauseated, but did not vomit. The pain persisted all night, preventing sleep. She was seen by a relief doctor in the morning who gave her a hypodermic, probably morphine, and sent her to the hospital. There was no story of any previous similar attacks.

Past and family history was unessential. Systemic inventory disclosed dyspnea on exertion, marked in climbing stairs, and palpitation and tachycardia. Being up and about for any length of time caused marked edema of the ankles.

Menstruation started at the age of twelve and was always regular. Menopause occurred at forty-two years of age, with no flow until the past few months when she flowed slightly for a day or so at irregular intervals.

Physical examination revealed a markedly obese female, who admitted weighing over 350 pounds, lying comfortably in bed and complaining of no pain. Temperature was 98.2° F. by mouth, pulse rate 100, and respiration 24.

There was slight enlargement of the heart to the left, and a soft systolic blow over the base. The lungs were hyperresonant throughout, with a few râles at the bases. The abdomen was tremendously obese. What seemed to be the liver edge was palpated about one inch below the right costal arch. An umbilical hernia, the size of an orange, was easily reducible. Attempts at determination of rigidity were futile. There was tenderness on deep palpation over the right lower quadrant. Varicosities of both legs were marked. Pelvic examination was most difficult; there was a questionable feeling of fullness and some tenderness in the right side, but nothing definite could be made out. Urinalysis showed one-plus albumin, no sugar. Microscopic examination showed no abnormalities. Leucocyte count was 14,000.

Because of the opiate and the obesity it was difficult to evaluate the symptomatology and physical findings. With a tentative diagnosis of mild acute appendicitis, we decided to observe the patient for several hours.

At 7:00 P.M. there had been little change. The patient was fairly comfortable. Temperature was 99.6° F. rectally. Abdominal and pelvic findings were still indefinite. The white blood count had dropped to 11,000, and we thought we could observe the patient some hours longer with safety.

By noon the next day, however, the patient had more pain. There was a temperature rise to 100° F. rectally, a rise in pulse rate to 104, and definite resistance of the right rectus muscle. We decided to explore the abdomen. Under ethylene and ether anesthesia, the abdomen was opened through a right rectus incision. Less difficulty was encountered from the obese abdominal wall than had been anticipated. A large, blue purple mass filling the right half of the pelvis (Fig. 1) presented itself immediately. It was easily delivered into the wound and was found to be a hydrosalpinx, the pedicle of which was twisted clockwise 3 full revolutions. There was considerable extravasation of blood into the right broad ligament and the ovary. The tube, ovary, and most of the broad ligament were removed and the stump of the broad ligament was peritonized. The appendix, which had been loosely adherent to the mass as well as to the cecum, was removed. Closure was in layers using chromic catgut and silk, and was not difficult.

Carbon dioxide was administered every hour postoperatively until hyperpnea appeared. Convalescence was uneventful except for some cough and temperature rise to 102° F. rectally, the second day. On the fifth day the patient was allowed to sit on the side of the bed. On the seventh she was allowed in a wheel chair. She began to walk on the eighth day and was dismissed from the hospital on the tenth day, the wound being well healed.

There has been no recurrence of the vaginal bleeding in the past year. Eight months after operation she was readmitted to the service with an incarcerated umbilical hernia which was repaired by Dr. M. L. Parker under local anesthesia and which was followed by an uneventful convalescence.

Whether in this instance the obesity, with slight cardiac decompensation, caused venous congestion of the pedicle as part of generalized congestion, and whether this played a rôle in the causation of the torsion, are questions that cannot be answered definitely, though we feel the relation cannot be disregarded.

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PSEUDOHERMAPHRODISM*

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(From the Obstetrical and Gynecological Department of St. Luke's Hospital)

THE patient, aged four and one-half years, was admitted to the Genito-Urinary Service of Dr. Harry Culver, St. Luke's Hospital, Chicago, Illinois on Sept. 24, 1936, with these diagnoses: bilateral undescended testes, hypospadias, precocious physical development, and acne vulgaris.

The history as given by the parents is as follows: The child was born prematurely at seven months and during the first year of life was considered a female. During the second year, however, the child was thought to be a male because of a rapidly developing penis. This enlargement continued during the third and fourth years of life. Because the testes failed to descend, the child at the age of three and one-half years was given injections of antuitrin-S for a period of a year. Coincident with the injections of the antuitrin-S there was a rapid growth of pubic hair but the testes failed to descend.

Examination on Sept. 24, 1936, revealed a four-and-one-half-year-old child with a large, well-developed, muscular body weighing 67 pounds. An extensive acne involved the face. Examination of the external genitalia revealed a penislike structure 4 cm. long at the base of which there was an external urethral orifice. There was a scrotallike structure void of testes which was divided by a shallow cleft and resembled labia majora. Covering the pubic and perineal regions, there was an extensive growth of hair (Fig. 1).

Cystoscopic examination done on Oct. 19, 1936, at St. Luke's Hospital by Dr. Harry Culver revealed an opening in the floor of the urethra two-thirds of the distance out from the bladder neck. This opening, 1.5 cm. in diameter, was partially covered with a delicate membrane. The cystoscope was passed through this opening and a vagina void of an external opening was observed. In the vault of the vagina there was a normal cervix. With a catheter in the anterior portion of the urethra a cystogram was made which demonstrated the urethra, the vagina, the above described communication between the two, and the normal urinary bladder (Fig. 2). Abdominal exploration done at this time revealed normal internal female pelvic organs. X-ray examination demonstrated that the sella was normal. The epinephrine curve was normal. The Aschheim-Zondek test was negative.

From the history, the examination, and the operative findings, it was determined that the patient was a girl with normal uterus, tubes, and ovaries. The external genitalia varied from normal in that the vagina had no external opening but rather opened into the urethra. The thin, delicate membrane covering this vaginal opening was considered to be the hymen. The clitoris resembling a penis was markedly hypertrophied. The patient was discharged from the hospital on Oct. 20, 1936.

The patient was admitted to St. Luke's Hospital the second time on Jan. 18, 1937. On Jan. 25, 1937, the hypertrophied clitoris was amputated and through a medial perineal incision an external opening of the vagina was constructed. The urethro-vaginal communication was closed. An indwelling catheter was placed in the bladder and the vagina was packed with vaseline gauze. The postoperative course was uneventful.

*Presented at a meeting of the Chicago Gynecological Society, March 19, 1937.

Examination under anesthesia on Feb. 10, 1937, revealed a normal-sized vaginal opening, the healing of which had progressed by primary intention. The vagina was of ordinary depth and there were no adhesions. The patient was discharged from the hospital Feb. 27, 1937, at which time the vagina was healed and appeared normal and the patient was voiding with control.

The fourth admission of the patient to St. Luke's Hospital was on June 10, 1937. The vaginal orifice had contracted so that it admitted only a number 12 F. sound. Under anesthesia the vagina was dilated to a number 30 F. Exploration of the



Fig. 1.

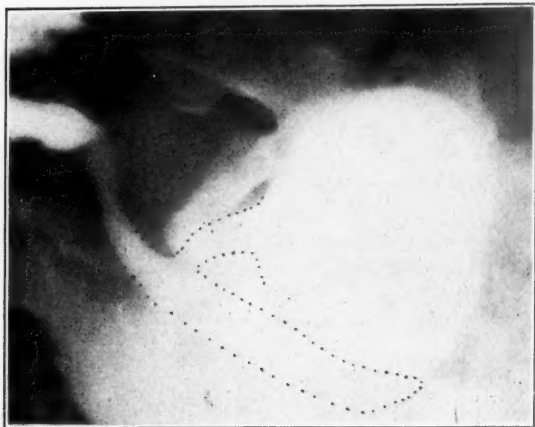


Fig. 2.

vagina at this time disclosed a normal, well-healed mucosa and a vagina of normal depth. The child was discharged as cured June 12, 1937. The vagina was found to be of normal depth and adequate caliber when examined on Nov. 1, 1937.

DISCUSSION

Pseudohermaphroditic changes similar to those found in this patient have been experimentally produced in the female rat by Greene and Ivy.¹ Some of their animals had a hypospadiac penislike external organ identical to that noted in this

patient. Some animals had a normal upper vagina which had no external opening, but opened into the floor of the urethra in a manner similar to that shown in Fig. 2. These workers produced the abnormalities in the offspring by injecting the pregnant mothers with testosterone.

The striking similarity of the findings in the patient presented and those experimentally produced in the rat would indicate that in the human being there was a failure in the development of the sinovaginal bulbs² from which the lower part of the vagina is normally derived. Such a failure in development is undoubtedly the result of masculinization of the urogenital sinus.

Since androgenic substance is found in normal human pregnant urine³ and in placentae,³ it is possible that the human pseudohermaphrodite is produced by an excess of this substance in the maternal fetal organism.

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FORCEPS FOR THE FLOATING HEAD IN LOW CESAREAN SECTION

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(From the Department of Obstetrics, College of Medicine, U. P.)

THIS instrument has been specifically devised for the purpose of delivering the head in situ through a lower uterine segment transverse incision. However, it can be used to extract the head through any form of uterine incision, provided the lower angle of the incision is near the lower pole of the head and provided the head is not engaged.

The instrument is composed of two blades: a posterior one possessing a large deep cephalic curve and an anterior straight blade. The posterior blade is the important part of the instrument and, in most instances, it alone suffices to enucleate and extract the head. The anterior blade is merely accessory and serves when used to steady the hold on the head. It is seldom necessary.

The purpose of the instrument is to extract the head by scooping it out from its bed. This is done by the main blade whose concavity is shaped to accommodate the head and face in their lowermost and posterior portions.

The indications for its use are as follows:

1. The head must be the presenting part.
2. The head must not be engaged but be well above the inlet.
3. The uterine incision must be long enough to allow the passage of the head.

The lower part of the uterine incision should correspond to the lower part of the head at about the level of the anterior parietal prominence. Then, facing the feet of the patient, the operator with his left hand guides the insertion of the main blade by gently lifting the head upwards toward the fundus and at the same time with his right hand, he slips the tip of the blade over and closely hugging the cranium and posterior cheek of the fetus. When in place, the handle should be perpendicular to the floor.

In cases of transverse or semilunar incision, the upper uterine flap should be gently retracted upwards with one or two retractors while the head is being delivered by firmly pulling the handle upward in a continuous traction towards the ceiling and with a slight inclination toward the fundus so as to deliver first the lower pole of the head. The extraction of the head is greatly facilitated if at the same time that the operator lifts up the head, the assistant pushes the fundus downwards. Once the head is extracted, the shoulders and the rest of the body are delivered as in other forms of lower cesarean section.

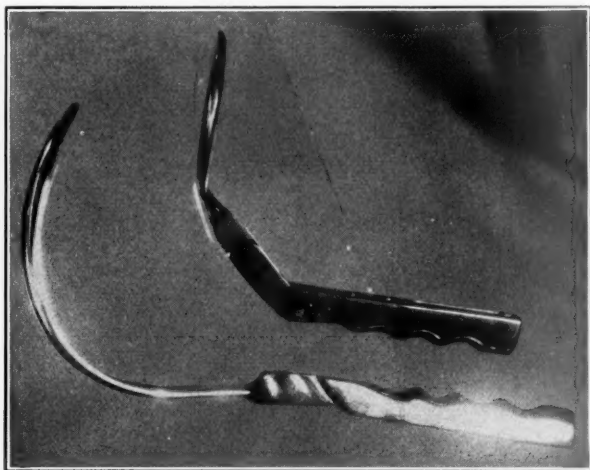


Fig. 1.—Anterior and posterior blades of Acosta-Sison's forceps. The posterior or main blade is the essential part of the instrument. It alone may suffice to extract the head.

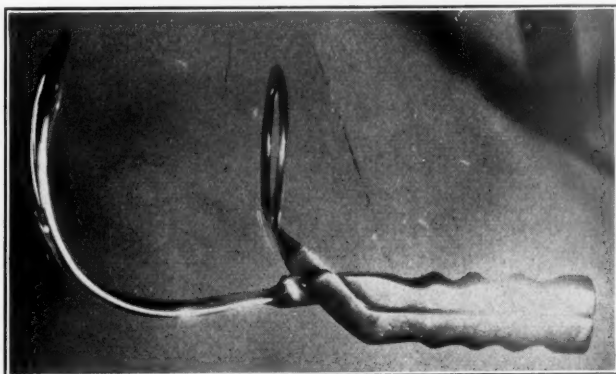


Fig. 2.—Acosta-Sison's forceps when both blades are articulated.

The advantages of the instrument when the indications are observed, are as follows:

1. It is not necessary to turn the face of the child and therefore it is time saving.
2. It is the most practical instrument to be used in cases of placenta previa where the head is high.
3. It can be used when the uterine incision is longitudinal but of specific advantage when the incision is transverse semilunar or T-shaped.

Contraindications.—1. It should not be used when the head is partially engaged unless it is possible to disengage the head and bring its lower portion to the lower angle of the uterine incision. In prolonged labors where marked caput succedaneum has been formed, it should not be employed.

The reasons for this are that in such cases, the blade cannot be inserted between the lower part of the head and the uterus.

2. It should not be employed when the bladder attachment is so high that the uterine incision cannot be made over the head unless the bladder can be well dissected off. Other technique must be employed in extracting the fetus in these conditions.

Technique.—1. The patient should be in the Trendelenburg position and the head should be pushed well above the pelvic brim. The same precautions and care are observed as in any low cesarean section as far as the exposure of the lower uterine segment and suctioning off the spill. However no pituitrin or pitocin should be injected until after the posterior or main blade has been inserted in place.

2. The lower angle or portion of the uterine incision (be it longitudinal, transverse semilunar, or T-shaped) should be near the lower pole of the head at about the level of the parietal prominence.

1002 TAFT AVENUE

AN INTRAUTERINE SEPARATION OF FETAL SCALP

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(From the Obstetrical Service of the Harlem Hospital)

MRS. E. A., aged twenty-four years, a colored hospital maid, was first admitted to the Obstetrical Service of the Harlem Hospital on April 23, 1932. Her previous history was negative except for one stillbirth and one miscarriage. Her last menstrual period took place on Sept. 8, 1931. The patient stated that the membranes had ruptured shortly before admission and that labor pains were occurring at intervals of thirty minutes.

The cervix admitted one finger, membranes being intact, felt between examining finger and presenting part. The fetal heart was heard in the left lower quadrant; the rate was 130. Fetal movements were felt. As the pains ceased and the patient wished to return home, she was discharged on April 27 with a diagnosis of false labor and was referred to the Antepartum Clinic for further observation.

The patient was readmitted to the Hospital on May 2; she complained of more frequent labor pains and of the passage of bloody fluid, but no clots, from the vagina. There was no history of trauma, headache, vomiting, chills, or fever. On examination, the cervix admitted one finger. The uterus was the size of a seven months' pregnancy. The fetus was presenting as a vertex in the right occipito-anterior position; the fetal heart could not be heard. The patient's temperature and pulse were normal; her general condition was considered good. Blood Wassermann and Kahn tests were both negative. Vaginal smear showed many gonococci.

On May 4, eleven days after the first admission, a hair-covered piece of fetal scalp about 7 cm. in diameter passed through the vagina. Sharp spicules of bone could be felt within the cervix, which at that time admitted four fingers. With the patient under ether anesthesia, an attempt was made to remove the fetus by

craniotomy. This failed, however, because several pieces of the fetal skull became detached, and it was impossible to grasp, crush, and deliver the entire head through the partly dilated cervix. The cervix was dilated manually, and the macerated fetus, weighing 4 pounds and 2 ounces, was delivered by version and breech extraction. This form of delivery, while contraindicated by the presence of infection, was resorted to because it was the one only other possible way of delivering this patient expeditiously. Frank, greenish yellow pus was present on the amniotic surface of the membranes, but not in the uterine cavity. Nonhemolytic streptococci and staphylococci were obtained on culture of this pus.

The patient made an uneventful recovery and was discharged on May 17, 1932.

This case is reported for three reasons: First, because we have not been able to find any case of spontaneous intrauterine separation of the fetal scalp reported in the literature. Second, the importance of certainty of rupture of membranes in patients who give suggestive histories so that such patients may be adequately hospitalized and treated prophylactically. Third, premature rupture of membranes predisposes not only the mother to infection and complications of labor, but her unborn child as well.

51 EAST 90TH STREET

STRANGULATION OF THE FALLOPIAN TUBE

H. E. BOWLES, M.D., HONOLULU, HAWAII

(*From the Queen's Hospital*)

THE patient was operated upon by us under the mistaken diagnosis of a probable gangrenous or ruptured appendix:

M. M., an unmarried schoolgirl, aged sixteen, Hawaiian-Caucasian, was admitted as an acute emergency to Queen's Hospital, at 9:30 the evening of April 24, 1936. Chief complaints were nausea, vomiting, and right lower abdominal pain. Marked constipation was present and there was a heavy feeling over the entire lower abdomen for two days before admission. At about this time, a normal menstrual period began. Seven and a half hours before admission the patient had eaten a meal of chop suey. Two hours and thirty minutes after that, she had attacks of cramplike pain around the umbilicus. She vomited almost simultaneously, first the recently ingested food, then greenish fluid. Nausea and vomiting then gave way to retching which continued until the time of admission, at which time the patient raised only small amounts of red-streaked mucus. Three or four semiliquid stools were passed shortly after the onset of the pain. These were believed to be due to a proprietary cathartic which the patient had taken earlier in the day.

There is nothing of note in the patient's past history except that she was kept under observation for two or three days just a year previously for a suspected sub-acute appendicitis. A dull nagging ache and constipation were present and cleared up promptly under small repeated doses of caroids and bile salts. The blood count was normal at that time. Menses commenced at thirteen and have been regular with a minimum of discomfort. Tonsils were taken out under local anesthesia two weeks before the present illness. Convalescence was uneventful. The patient is one of 10 healthy children, and her parents are living and well.

Positive physical findings were as follows: An acutely ill part Hawaiian girl, retching, and complaining of severe pain in the right lower abdomen. Temp. 99.6° F.

Tongue furred and white. Lips dry and cracked. Abdomen moderately distended. Definite tenseness of lower right rectus with tenderness over McBurney's point, and just below it. Decreased peristalsis in the ileocecal region. Hymen intact. No leucorrhea. Tenderness in right fornix on rectal examination.

The patient was admitted as an emergency to Queen's Hospital where a leucocyte count of 21,000 with 84 per cent of neutrophils was obtained. Hemoglobin was 95 per cent, and the urine was negative except for a trace of albumin.

Eight hours after the onset of the first symptoms, the abdomen was opened through a low right rectus incision. There was a moderate amount of pink-tinged free fluid in the pelvis. The appendix appeared grossly normal. The uterus was very small and infantile. Both ovaries were slender and elongated and appeared otherwise normal. The left tube was normal except for three small pedunculated excrescences just mesial to the fimbriated end. These structures hung like minute

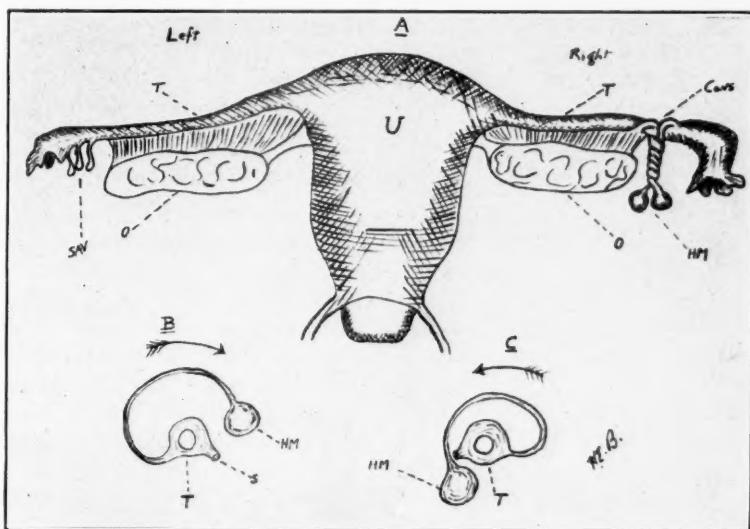


Fig. 1.—A: U, uterus; T, Fallopian tube; O, ovary; SAV, small appendices vesiculosi; HM, stalked hydatids of Morgagni; Cons., constriction produced by the twisted hydatids. B: T, Fallopian tube; HM, hydatid of Morgagni; S, stump showing attachment of stalked hydatid of the opposite side. C: Same lettering as B.

grapes on pedicles of about 2 mm. length. These were removed. The right tube showed no evidence of infection, but its distal end was swollen and cyanotic, and at the junction of the distal 1/3 with the mesial 2/3, there was a tight constricting band produced by the pedicles of two grape-sized cysts filled with clear watery fluid. One of these arose from each side of the right tube and passed up and over and down on the opposite side from which it arose. In addition these sessile pedunculated cysts were twisted on each other so as to make three complete turns. They were untwisted in a counterclockwise manner, and the stalks were severed and ligated at their bases. There was no evidence of any necrosis or stricture, and the tube was left alone. The cyanosis began to clear as soon as the constriction was removed. No other abnormalities were found. The appendix was removed by the usual routine, and the abdomen closed without drainage. Convalescence was uneventful. The patient has had no further recurrence of symptoms, and has menstruated normally and without pain.

SUMMARY

A case of torsion of two pedunculated hydatids of Morgagni (vesicular appendages), is reported in which the symptoms were such as to lead to the diagnosis of a rupture or gangrene of the appendix. Laparotomy was performed and the right tube was found to be strangulated in its distal portion by the above mentioned cystic bodies. A peculiar series of twists was present, the mechanism of which was not clear. The available literature was carefully reviewed and it was found that seven other similar cases have been previously reported, all of them being young married women or adolescent girls. All cases showed acute abdominal symptomatology urgent enough to demand surgical intervention, and all recovered. Five out of the eight cases were diagnosed as acute appendicitis. Six out of 8 (75 per cent) occurred in the right lower abdomen. A ninth case reported by Meigs, details lacking, is also mentioned.

DISGERMINOMA OVARIUM

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(From the Department of Gynecology of the Beth Moses Hospital)

UNTIL recently, these tumors were diagnosed as ovarian carcinomata or sarcomata, and it is only lately that they are properly classified. Most authorities agree that disgerminoma is but mildly malignant. The prognosis seems to be favorable especially if the neoplasm is removed early. The possibility of its presence should be suspected upon finding a solitary solid ovarian neoplasm in a young woman. Conservatism should be the rule, and only the affected ovary should be removed. This point should be borne in mind when the remaining ovary becomes enlarged subsequently, so that conservatism may be practiced whenever possible. The case here reported will bear out this point.

Mrs. L. J., aged twenty-four, white, was admitted to the Beth Moses Hospital, Oct. 27, 1931, complaining of pain in the lower abdomen of two months' duration. Family history was negative. Past personal history was negative. Menstruation started at the age of thirteen. It occurred regularly every twenty-eight days and lasted for four days. There was no dysmenorrhea. Last menstrual period was three weeks before admission; it was regular as to time and duration. Patient had had one child, now three and one-half years old. Physical examination revealed a well-nourished, white woman, not acutely ill. Head, neck, heart, and lungs were essentially negative. Abdomen was soft and not distended. There was tenderness upon deep pressure over the right lower quadrant, where a mass, apparently arising from the pelvis, could be palpated. Vaginal examination showed moderately relaxed introitus; no rectocele or cystocele. The cervix was closed, somewhat eroded. It could be moved from side to side without eliciting any pain. The uterus was normal in size, pushed over to the left by a semisolid mass the size of a small grapefruit, and could be felt through the right fornix. The mass was movable and very tender. A diagnosis of ovarian cyst was made. Blood pressure was 112/80. An examination of the urine and blood did not reveal any abnormal findings. A laparotomy was performed on Oct. 28, 1931. The following findings were noted: Right ovarian tumor, the size of a grapefruit, irregular and nodular in outline. The uterus, left tube and ovary were apparently normal. A right salpingo-oophorectomy was performed. The abdomen was closed without drainage.

The pathologic diagnosis at the time was primary medullary carcinoma of the right ovary. Only recently, in reviewing the specimen, the diagnosis of disgerminoma was made, with the following pathologic description:

Gross.—Specimen consisted of an ovarian mass, measuring 12 by 9 by 5 cm., fairly soft in consistency. Its outer surface was nodular, pinkish yellow, with numerous fairly large vessels coursing immediately below the surface. On cross-section the mass consisted of soft, yellowish, nodular tissue, the nodules projecting somewhat above the cut surface and demarcated by narrow fibrous bands.

Microscopic.—The mass was composed of interlacing plaques and nests of polygonal cells with a dustlike or powdery cytoplasm and nuclei that varied considerably in size and tinctorial capacity. The latter varied from small pyknotic to large hyperchromatic nuclei with coarse chromatin clumps and an occasional nucleolus. Numerous mitotic figures were present. The nuclear and cellular membranes were distinct. The cellular masses were enclosed within a trabecular network of fibrillar connective tissue containing many small lymphocytic cells.

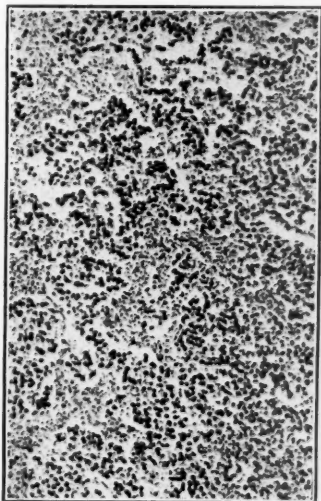


Fig. 1.

Fig. 1.—Interlacing plaques of polygonal cells and trabecular network of connective tissue containing small lymphocytic cells.

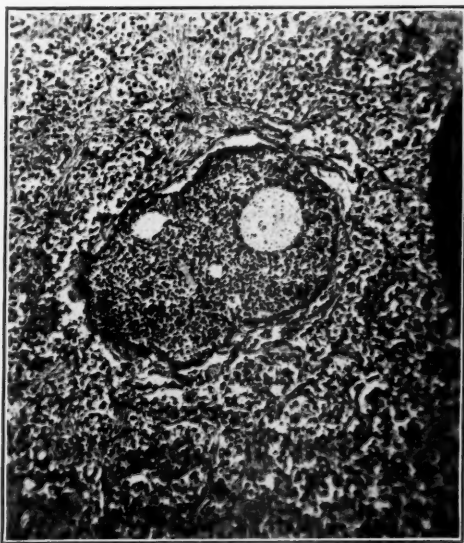


Fig. 2.

Fig. 2.—Follicle, containing ovum, zona pellucida and granulosa cells found in the midst of tumor mass.

While no remnants of ovarian stroma could be distinguished, two ova containing follicles had been found. The ovum, zona pellucida, and granulosa cells were present. In one follicle there was beginning cavity formation. The internal and external thecae could not be found.

Diagnosis.—Disgerminoma ovarii.

The patient made an uneventful recovery. She was discharged from the hospital Nov. 9, 1931, in good condition. She was in good health until February, 1935, at which time she began to complain of pain in the lower abdomen. There was no menstrual disturbance. A vaginal examination showed a slight enlargement of the left ovary. Since the diagnosis of medullary carcinoma of the right ovary was made four years previously, a secondary involvement of the left ovary was suspected, and

a panhysterectomy was performed at the Beth Israel Hospital during March, 1935. The pathologic report was that of a normal uterus and a chronic salpingo-oophoritis. There was no evidence of malignancy in the ovary.

Had the diagnosis of dysgerminoma been known at the time of the patient's second admission to the Hospital, she might have been spared the radical operation, since this tumor is not very malignant, especially when removed early. The patient would have been either treated expectantly, being watched for any further enlargement of the ovary or a biopsy and frozen section examination would have been made at time of operation and the ovary saved.

THREE CASES OF CARCINOMA OF THE CERVIX WITH PROCIDENTIA

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DECUBITUS ulcers very frequently complicate the prolapsed cervical and vaginal mucous membranes, but true carcinoma in association with procidentia, is rarely seen. In fact, whereas about 3 per cent of women develop carcinoma of the normally placed cervix, only one-half of 1 per cent of those with procidentia show this complication.

A review of the literature shows some 50 cases of carcinoma of the cervix with procidentia on record. In 1882 Fritsch, writing in Billroth and Pitha's *Handbuch*, states "it is remarkable that the prolapsed uterus seems to be almost immune against cancer." Judd, of the Mayo Clinic, reports but 3 cases of cervical cancer in 2,188 cases of procidentia. In 1930, a questionnaire sent to leading American gynecologists, revealed the fact that 52.3 per cent of them had never seen a case, while another 27 per cent had seen only one. Sellheim, of Leipzig, Hartmann of Paris, and Schroeder of Kiel, in 1931, had not seen the two conditions associated. Emmert and Taussig, on the other hand, in a fairly recent article, state their belief that if all decubitus ulcers were carefully sectioned and studied pathologically, carcinoma would be found more frequently. This conclusion is based on the fact, that in 10 consecutive uteri removed for procidentia, carcinoma was found four times. In reviewing 683 cases of procidentia, Smith, Graves and Pemberton, found only one case of cancer, and every cervix in the series was carefully studied microscopically. Graves says, "despite the pregnancies, the instrumental labors, the irritations; despite the leucoplakia, hypertrophy, impaired circulation and infection, conditions which predispose to cancer in the normally located cervix, only one patient was found with cancer of the protruding cervix." This seems to prove conclusively, the comparative rarity of carcinoma with procidentia.

In the past ten years, there have been 3 such cases, in the two large English-speaking hospitals of Montreal. These 3 cases illustrate two definite types of cancer, the one a slowly-growing mature form which developed on a cornified cervix which had been prolapsed for years; and the other an immature, highly malignant type developing on a recent prolapse, in a younger woman.

The first of our cases was a woman of seventy-two years, admitted because of a prolapse which she had had for twenty-five years. About the cervical os, was a roughened heaped-up area which bled slightly on being touched. Due to many years of irritation and exposure, the mucous membrane had become markedly thickened,

more like a skin surface than true mucosa. However, even this keratinized epithelium, in this cancer susceptible patient, finally forsook its bounds, for a biopsy showed a low grade malignancy. There has been no recurrence of the growth following a vaginal hysterectomy done eight years ago.

The second case, a woman eighty years of age, was admitted to the Montreal General Hospital in September, 1936, with a complete procidentia which she had had for forty years. Recently there had been some bleeding and purulent discharge. The cervix was very large, about the size of a tangerine, covered with a rough, irregular, crusty growth which sharply demarcated it from the vaginal epithelium. There was slight oozing in several places. A section taken from this mass, just below its junction with the more healthy vaginal epithelium, showed marked prolongations of the epithelium into the tunica propria, a Type 1 carcinoma. A vaginal hysterectomy was done, on October 21, last, and the patient was discharged on November 15, well.

In 1934, a patient admitted to the Royal Victoria Hospital, showed a complete prolapse with a large, friable, fungating cauliflower mass, evidently carcinomatous, attached to the cervix. Under anesthesia the uterus could be replaced in the vagina. This was done and radium placed against the growth in the usual manner, giving a total dosage of 5,440 mg. hr. in three treatments. Neither the carcinoma nor the procidentia has recurred since the treatment.

AIR EMBOLISM

JAMES E. STROH, M.D., AND M. T. OLINGER, M.D., SEATTLE, WASH.

A THIRTY-NINE-YEAR-OLD white woman (para ix) entered the hospital twelve days past the calculated term of pregnancy. All previous nine pregnancies had been full term with no complications. The first (1923) had been a forceps delivery with episiotomy. The other deliveries were spontaneous and normal, the last occurring in October, 1934. The present pregnancy had been uncomplicated clinically, with normal urine and blood pressure.

On entry the uterine contractions were irregular. The head was well down on the perineum but there was no cervical dilatation. After being in the hospital for ten or fifteen hours, the uterine contractions ceased altogether. A Watson induction was done and the patient began active labor and delivered forthwith. This was a normal spontaneous delivery with an estimated blood loss of about 100 c.c.

The postpartum period was uneventful, until on the morning of the seventh day when shortly after assuming the knee-chest position for the first time, the patient suddenly collapsed and became unconscious. There was cyanosis of the lips and fingernail beds. The head was pulled to the right with the eyes turned in the same direction. Pupils dilated, the neck was stiff, and the arms and legs spastic. Respiration was forceful and increased in rate. The radial pulse was imperceptible. On examination of the chest there was no dullness on percussion, no râles nor friction rubs. Breath sounds were normal, pulse 88, heart rhythmical and tones of fairly good quality. No murmurs or other unusual sounds were heard.

One ampule of coramine was given intravenously and 1 c.c. of adrenalin subcutaneously. Artificial respiration was used. In spite of this the patient ceased breathing and died quite suddenly, not more than four or five minutes from the time of the onset.

Autopsy Findings.—When the abdomen was opened, the uterine vein on the right side, viewed in situ, contained an abundance of air. There were no important gross changes in the aorta or other large vessels of the trunk other than that the inferior vena cava contained an abundance of gas bubbles. The main portion of the pulmonary artery contained only fluid blood mixed with bubbles and no clotted blood.

The entire uterus with Fallopian tubes, ovaries, and liberal portions of the broad ligaments and vagina were removed in toto. The vagina was fastened to an air hose and air was forced into the vagina and uterus under very slight pressure. The uterus became slightly distended; and as air insufflation continued beyond this point, air escaped liberally from a small vein on the right side which apparently had extended to the plexuses of veins in the broad ligaments. It was noteworthy that no air escaped from the Fallopian tubes at this low pressure but flowed freely through the sectioned vein in preference.

The air insufflation was stopped, and a solution of methylene blue was injected through the cut end of the vein where the air escaped. Afterward, the uterus was sectioned and the pathway of the methylene blue could be traced in the fundus of the uterus from serosa to lining along a devious pathway through the muscle. No large channel as such could be demonstrated in the muscle tissue. The Fallopian tubes are anatomically patent.

Anatomic Diagnosis.—Extensive air embolism of the right ovarian vein, superior vena cava, and right heart chambers; and involution of the uterus.

418 MEDICAL-DENTAL BUILDING

OMENTAL ABSCESS FOLLOWING CATHETER PERFORATION OF UTERUS

MORRIS FELLMAN, M.D., JERSEY CITY, N. J.

(From the Jersey City Medical Center)

THE bizarre mechanism by which the peritoneal cavity disposes of foreign bodies is difficult to interpret, because in no two cases can the end-result be predicted with certainty. In one a fulminating peritonitis may develop with toxemia and fatality; another may show a persistent sinus with an opening anywhere in the abdominal wall or through the rectum or vagina; finally encapsulation may take place. The case reported here is of interest because it affords opportunity for speculation concerning the process that goes on when a foreign body reaches the peritoneum through an unsurgical approach. In this instance, a catheter introduced into the uterus for the purpose of criminal abortion was completely passed through it into the abdominal cavity and was later found encapsulated by the greater omentum in which it had caused the formation of a localized abscess.

T. D., aged thirty-two, married, white. Three months after last menstrual period, the patient passed a catheter into the uterus. She stated that she started to bleed at once. This continued for several days and then she passed some tissue by vagina while straining during a bowel movement. Shortly afterward she began to complain of lower abdominal pain and during the day felt chilly and feverish. These were the symptoms for which she was admitted to the Jersey City Medical Center.

She was hospitalized for a period of six days during which she was very much improved. Pelvic examination revealed a laceration and erosion of the cervix of

moderate degree, very slight tenderness in the fornices and no bleeding. There was only a small amount of brownish yellow cervical discharge. Abdominal examination was negative. It was noteworthy that she failed to recall what happened to the catheter but because of the association of the passage of uterine contents with defecation it was assumed that it also had disappeared at that time.

Twenty days later the patient sought re-admission to the hospital. Since her discharge, she complained of persistent sharp pain in the right lower quadrant, aggravated by standing and walking and slightly improved while lying down. She had occasional attacks of nausea and vomiting. Upon examination there was tenderness in the right lower quadrant over McBurney's point and moderate rigidity. She had no chills or fever during her original stay. The temperature was 100.8° F. and the white blood count showed 10,250 leucocytes with a differential of 76 polys and 24 lymphocytes.

However, it was felt that an acute appendiceal involvement was present and a laparotomy was done. When the peritoneum was incised the omentum was unusually adherent. As it was freed a hard and friable mass was noticed. When it was delivered, a perforation was accidentally made and through this opening a small amount of greenish yellow pus, with a colon odor, was expressed. The opening was further enlarged and the object was discovered, which upon removal and examination was found to be a hard rubber catheter. This had become curled upon itself and tucked within the omental folds. Upon the superior portion of the uterine fundus, near the left tube, a healed perforation, the diameter of which compared to the size of the catheter, was found. This was the point of entrance. The diseased omentum was resected and the pathologic report follows: Section of specimen marked "omental tissue" shows a fibro-adipose vascular stroma infiltrated with polys. Diagnosis: omental abscess.

The bacteriologic report of the abscess showed occasional *Staphylococcus aureus* and many *B. coli*.

For the first few days postoperative the patient had a mildly stormy course associated with distention and nausea. This cleared up and on her eighth day a small infection in the lower angle of the wound developed. She was discharged on her twenty-ninth postoperative day fully healed and recovered.

118 JEWETT AVENUE

A RECTAL GUIDE

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IN REPAIRING lacerations of the perineum following labor, especially if deep bites are taken, occasionally one finds that, inadvertently, the suture material has entered the rectum.

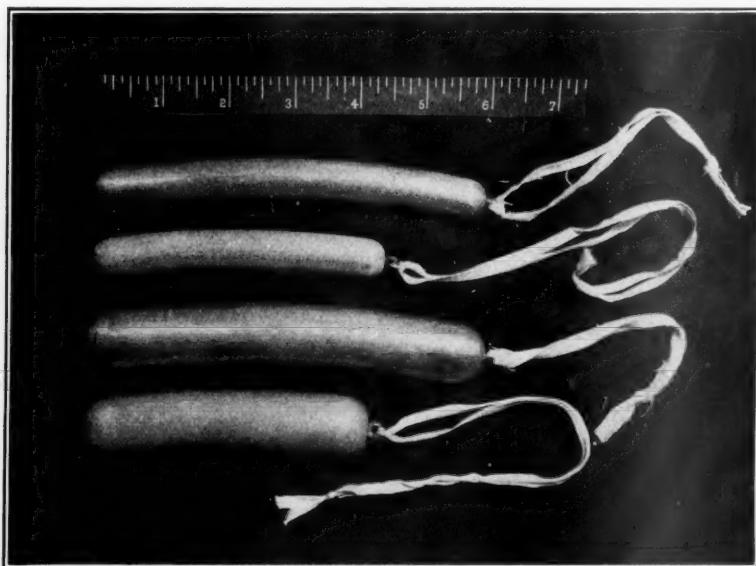
Some claim that this accident is merely an incident and harmless, nevertheless the possibilities of fistula and infection cannot be denied.

I have found that an indicator in the rectum is of value not only in avoiding puncture but also in repairing fresh rectal and sphincter tears and rectovaginal fistulas. The torn sphincter muscles can be more easily identified and approximated over the indicator. During perineoplasty, an indicator also will frequently prove of aid.

I have found that the sausage-shaped device here illustrated fills the requirements. Because of its shape it does not slide and is therefore not likely to slip

out of the rectum and contaminate the field, as so often happens when a sponge stick is used as a rectal guide. It is preferable to the finger in the rectum because it allows the operator the use of both hands and minimizes the opportunities for infection.

The guides or indicators I have been using are made of aluminum and have the following dimensions: $4\frac{1}{2}$ by 3 inches; $4\frac{1}{2}$ by 2 inches; 6 by 3 inches; 6 by 2 inches. Other metals or rubber may be used instead of aluminum.



In the majority of cases I use the $4\frac{1}{2}$ by 3 inch guide; where the anal canal is smaller, the $4\frac{1}{2}$ by 2 inch. In cases of sphincter tears I employ the larger guides.

The guides are lubricated with sterile soap or sterile lubricating jelly. The eye end is grasped by a sponge holder or uterine dressing forceps and the guide is gently introduced into the rectum. The sterile tapes are left dangling outside the rectum and at the completion of the repair, the guide is easily removed by pulling on the tapes.

1882 GRAND CONCOURSE

Politzer, G.: Abnormally Short Umbilical Cord and Its Consequences, Wien. Klin. Wchnschr. 49: 40, 1936.

The author describes a human embryo between 7 and 8 mm. in length in which there is a 90 degree rotation of the embryonic axis to the left. The facial anlage is in contact with the left "rump." The author attributes this torsion to an abnormally short umbilical cord. This condition is normal in the chick embryo and with embryonic development at maturity corrects itself with no evil consequences. Two theoretical possibilities are cited for this embryo; it may have corrected itself by subsequent growth or it could have persisted and then become responsible for a congenital torsion of the skeleton resulting in scoliosis.

W. B. SERBIN.

INEXPENSIVE OBSTETRIC MANIKINS

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(From the Department of Obstetrics and Gynecology, Stanford University School of Medicine)

MANIKINS, for obstetric teaching, are expensive, usually requiring an expenditure of about three hundred dollars each. Recently we were confronted with the need for additional manikins, and because of a shortage of funds made an investigation which solved our dilemma. We consulted local artisans about prices for manikins and considered such materials as cast aluminum, plaster, and wood. The latter offered the best possibilities, and a wood carver was consulted. This artisan copied one of our imported models in poplar wood, and for fifty-five dollars each we acquired four excellent manikins weighing no more than those of foreign manufacture.

Other less expensive woods could have been used to reduce the cost still further, but poplar wood seemed an ideal material because of its close grain and its re-

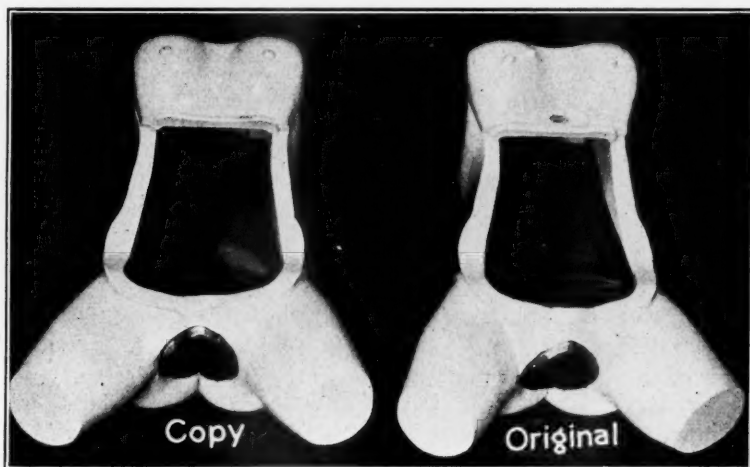


Fig. 1.

sistance to checking. The wood block for each manikin was built up of smaller pieces in order to strengthen the structure and prevent splitting during carving. Sufficient time was allowed to permit the glue to harden well. Otherwise trouble would have been encountered during carving. Four weeks is sufficient if the wood has been properly kiln dried. Each manikin received several coats of hard drying paint of flesh color, applied with a spray gun, following preparation of the wood with boiled linseed oil.

Rubber vulvas similar to those found on the commercial manikins were obtained and fitted on with a metal rim made of brass by a local coppersmith at a small cost, who also made similar fittings for the peritoneal rubber coverings.

These homemade manikins have been in use for three months and have proved satisfactory in every respect. In appearance they cannot be distinguished from the commercial product (Fig. 1) and the total cost for each did not exceed seventy-five dollars.

Because of the great saving and the satisfactory service given by these manikins the teaching staff of this department reports its experience.

Special Article

HENRY MILLER AND THE DEVELOPMENT OF SCIENTIFIC OBSTETRICS IN THE NEW WEST*

HERBERT THOMS, M.D., NEW HAVEN, CONN.

IN THE history of America it is the spirit of the pioneer which stands out as a vital force in that interesting drama. The story of the development of scientific medicine on our shores reveals the same powerful influence and the indomitable Daniel Drake comes to mind as a notable example of this attitude of mind. In the history of American obstetrics, this spirit of the pioneer is shown not only in those hardy souls who braved the Atlantic to receive the torch from the masters in the old world, but also in those who carried the light into the then remote parts of the new world. Such a one was Henry Miller of Louisville, Kentucky, whose influence in the development of obstetrics in the west was unparalleled.

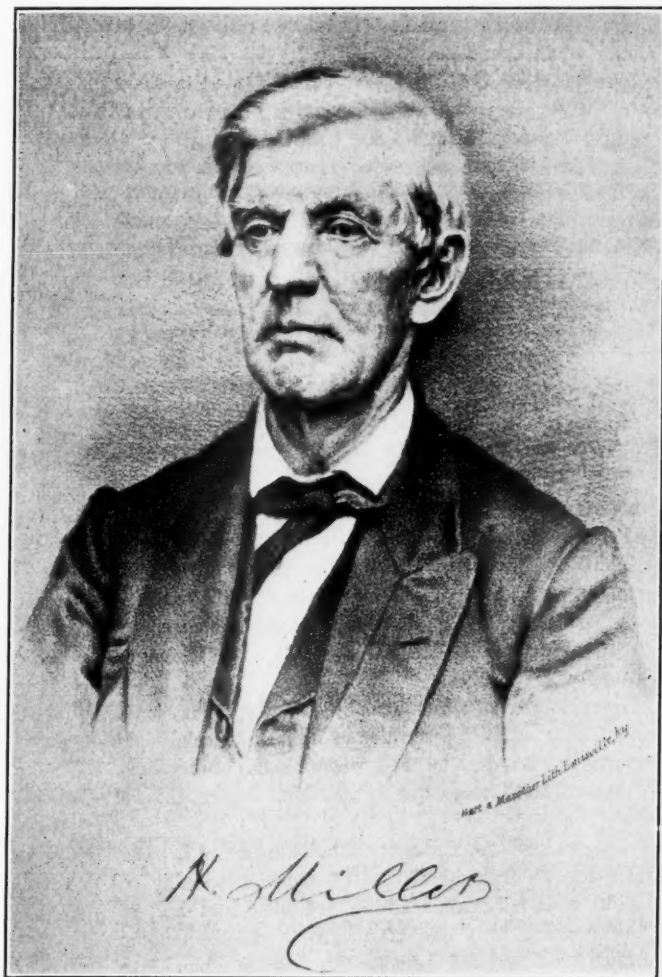
Henry Miller came by his pioneering spirit honestly, for his father was one of the first settlers in Barren County in the Green River section of Kentucky. It was here in the town of Glasgow that he was born Nov. 1, 1800. Henry Miller was denied the advantages of a collegiate training, his education being limited to that afforded by the country schools. In the first edition of his book, he says, "The author's education was not acquired in academic halls, but in the primitive school-houses of his native state and upon the ample sward, shaded by forest trees, appurtenant there unto. So you see he was reared after the fashion of Socrates, imbibing knowledge in the schoolhouse under the shade of the trees, and not infrequently perched upon their boughs."

At the age of seventeen, he began the study of medicine under two local physicians, Drs. Bainbridge and Gist. The practice of these men extended over a wide area, and in the absence of apothecaries they were obliged to compound their own medicines. At that time, much work of this character was relegated to the apprentice in medicine, including the extraction of teeth and the letting of blood. In this capacity the young Miller is said to have been "chief pharmacist, dentist and bleeder for his county." Two years later, in 1819, Henry Miller rode on horseback to Lexington to attend the first full course of lectures in the Medical Department of Transylvania University. Here he joined a student body of less than forty members and remained throughout the course. Partial courses had been given at Transylvania before but at this time a more common organization had been effected. The situation in Kentucky at that time seemed propitious for such an enterprise, the new west was becoming more thickly settled and more young men were turning to the professions. Furthermore, a journey to centers like Philadelphia was not only tedious but possibly dangerous. As late as 1820,

*NOTE: This biographic sketch should prove of interest in view of the Centenary celebration in 1934 which marked the founding of the Louisville Medical School.

Charles Caldwell recorded that "so deep and adhesive was the mud," that during four days he was able to cover but sixty miles on horseback.

As early as 1792, Transylvania "Seminary" had located in Lexington and in 1799 the Medical Department and Law College were organized. At a later reorganization of the Medical Department, Daniel Drake occupied the chair of Materia Medica and Medical Botany for a short time. The year 1819 saw a rebirth of interest in the Medical College



and the citizens of Lexington, the legislature, and various physicians in the south all pledged money for its development and maintenance. Among the medical faculty at that time were men of outstanding ability. Charles Caldwell, who occupied the chair of the Institutes of Medicine, and noted for his eloquence, had formerly been professor of natural history in the University of Pennsylvania. Samuel Brown in theory and practice, as early as 1802, had shown his pioneering spirit by vaccinating upwards of five hundred persons when at that time in New York and

Philadelphia, physicians were just beginning the use of cowpox virus. Benjamin W. Dudley in anatomy and surgery had enjoyed the advantages of four years of postgraduate study in Europe and was a renowned lithotomist.

At the end of the course, Henry Miller returned home and was taken into partnership with Bainbridge (Gist having removed to New Castle in Henry County). In the fall of 1821, he returned to Lexington for a second course of lectures, receiving the degree of doctor of medicine the next spring. His thesis, "Relation Between the Sanguiferous and Nervous Systems," was accorded such merit that it was published by the faculty.

A contemporary has left us this description of events following shortly. "At the following session of the Transylvania, the students began to express dissatisfaction with the opportunities afforded them for the study of practical anatomy. This branch of instruction was engrossed by Dr. Dudley, and carried on in the room above his amphitheater. The students procured their subjects as best they could from the graveyards in the city and surrounding country, and performed their dissections with but little supervision by the professor, while they were required to pay a very liberal fee. The complaints of the class were brought before the faculty and they resolved to appoint a demonstrator. Dr. Miller received the appointment and the first intimation he had of the discontent of the class and the establishment of a demonstratorship, was the official notice sent him by the Dean, Professor Richardson." Miller relinquished his practice in Glasgow in order to prepare himself for the new duties and spent some time in study in Philadelphia. On his return he was surprised to learn that Dudley had not given his consent to the appointment. Rather than enter a contest with his former teacher, he withdrew and returned to practice. In 1827, he removed to Harrodsburg in Mercer County, at that time the most popular watering place in the west. For nine years he remained here, building up an extensive practice.

In 1835, Henry Miller was called to Louisville to aid in organizing a medical school there. A number of resident physicians had already obtained a charter and the president of the board of trustees offered him the choice between the chairs of Anatomy, Practice of Medicine, and Obstetrics. He chose the latter and removed to Louisville in the fall of 1835. On his arrival he found the prospects for the new school uncertain, and the project about to be abandoned. He was not to be discouraged, however, and he aroused the community to the importance of the subject by a series of articles in the *Louisville Journal*. So powerful was the appeal that the faculty at Transylvania soon sensed the danger of a rival school at Louisville, a growing city where greater clinical facilities for teaching were possible. As a result, Professors Caldwell, Cooke, and Yandell of that institution joined the Medical Institute of Louisville, which later was merged into the Medical Department of Louisville University. The addition of these well known names brought great prestige to the new school. Caldwell became professor of materia medica; John E. Cooke, professor of theory and practice of medicine, and Lunsford P. Yandell occupied the chair of chemistry and materia medica. Later additions to this faculty included Daniel Drake and Samuel D. Gross. For twenty-one years, despite numerous changes in the faculty, Henry Miller served as professor of obstetrics and diseases

of women and children. In 1858 he resigned in order to devote more attention to his practice and nine years later a special chair of medical and surgical diseases of women was created for him. After a year he resigned this professorship to take a similar one in the Louisville Medical College, which he held until the time of his death, Feb. 8, 1874.

Of Henry Miller the teacher, his colleague Yandell has given us the following description.

"As a lecturer, Dr. Miller rose to distinction in spite of the greatest natural disadvantages. His voice was not good and his delivery was nearly as bad as it could be. It was painful to listen to him, until one had grown accustomed to his manner, so great was his difficulty of utterance, and yet he was a successful teacher. The slowness with which he was obliged to proceed enabled his pupils to take in all his matter, and his thorough mastery of his subject gave weight to his instructions. It was his happy constitution of mind to become so engrossed by the matter of his discourse that the drowsiness of his audience or even disorders in the lecture room were unnoticed, and his good nature contributed to the popularity which he gained by the sound practical character of his lectures. He had both humor and imagination, and would enliven his dry prelections by sallies of wit when his subject invited; but the quality of mind to which he owed his influence among men and his reputation as a teacher and a practitioner, was his sound vigorous understanding."

As a writer he was a frequent contributor to the journals of his day and among his papers is the report of a case of ovariectomy in 1847. His first textbook, *A Theoretical and Practical Treatise on Human Parturition*, appeared in 1849. In the preface he writes, "To give a full, correct and lurid description of the mechanism of labor is the leading object which the author had in view in writing his book," and, "We need at this time, a native authority to educe order out of confusion, and set up a national standard, under which all practitioners may arrange themselves and be cemented by a common bond of union." That the author was able to accomplish much of his desire is witnessed by the work itself.

At that time, the classification and nomenclature of fetal presentations and positions which prevailed in this country was that of Baudelocque made popular by Dewees. Some idea of the complexity and confusion existing in this subject may be gathered from Miller's text, as follows:

"M. Baudelocque's classification embraced *twenty-three genera* of presentations consisting of as many distinct regions of the fetal body, which he supposed might offer at the superior strait. Four of these genera he found at the cephalic and pelvic extremities of the fetus, viz., presentations of the vertex, of the feet, knees and nates, while the four planes of the body, between these extremities, furnished him—the anterior, with the face, the forepart of the neck, the breast, abdomen and thighs (five genera); the posterior, with the occiput, nape of the neck, side of the neck, the shoulder, side of the thorax and the hip (ten genera). These genera include ninety-four species which it would be useless as tedious to enumerate."

The classification which Miller recommended was essentially that proposed by Dugés and one which is largely universal today. To him belongs the credit for its early introduction into the literature of this country. The work is largely concerned with the mechanism of labor and such operative procedures as forceps operations and destructive measures. The pathology of pregnancy is not emphasized.

The second production from Miller's pen was *The Principles and Practice of Obstetrics*, which appeared in 1858. In this work his pio-

neering spirit is shown in the championship of specular vaginal examination and the use of anesthetics in labor, both highly controversial subjects at that time. With regard to the former he writes:

"Many writers and among them, Professor Simpson, are particular to direct that the speculum should be introduced under cover and with the aid of the touch alone, and some of them think that it is more decent and less offensive to female modesty, if the patient be placed upon her left side rather than the back. I used to be of this way of thinking, but my thoughts here changed, for after all the genital organs, including the vulva, must be seen; and if they are not seen sursum, they must be seen deorsum, so that it is only a sham to take these delicate precautions. Genuine modesty consists in scrupulously protecting our patients from unnecessary exposure; all beyond this is counterfeit." Regarding anaesthesia in labor, he records, "It was not until the twentieth of February, 1848, that anaesthetics were used in midwifery in Louisville, or so far as I know on this side of the Allegheny Mountains. The occasion occurred in my own practice," and again, "Believing that etherization in childbirth is one of the greatest benefactions of science, which has been made in this or any other age, and having enjoyed abundant opportunities of witnessing its triumphs, I should be recreant alike to truth and duty if I did not attempt to vindicate it against the objections which have been alleged by those high authorities in obstetric medicine." [i.e. Ramsbotham and Meigs.]

As in the previous work, the pathology of pregnancy receives but scant treatment. Once more it is the author's wish to present an "exposition of the cardinal principles of obstetrics," and again we see excellent chapters on the mechanism of labor and the common obstetric operations of that day. The sound principles inculcated in these fields show ample reason why this textbook had such wide influence in this country, quite beyond the author's own time.

In an age when pomposity and bombast were rife in medicine as in other fields of intellectual endeavor, it is gratifying to turn to the record of the life and work of Henry Miller and to see there in his honest simplicity, his essential greatness. As a prophet he was not without honor in his own country, for in 1859 at a meeting of the American Medical Association in Louisville, he was elected president. His long time friend and colleague, Samuel D. Gross said of him, "He was essentially a strong man, with a well-ordered and philosophical mind. Whatever he knew, he knew well." I think we must come to the conclusion that the success of Henry Miller as a man was due primarily to his great faith in himself. He was confident of the worth of the work he was doing and with ingenuous sincerity wrote: "Long ago it was said or sung, 'Westward the star of empire takes its way' and why may it not have reached the banks of the Ohio by this time?" In the roster of important contributors to the development of scientific obstetrics in America the name of Henry Miller must occupy a lofty position.

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Department of Practical Problems in Obstetrics and Gynecology

CONDUCTED BY WILLIAM J. DIECKMANN, M.D.

THE INDUCTION OF LABOR

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(From the Department of Obstetrics, Johns Hopkins University and Hospital)

THE frequency with which labor is being induced today by artificial rupture of the membranes constitutes one of the notable trends in modern obstetrics. When the method was introduced to American obstetricians between 1928 and 1930 by the work of Jackson, Slemmons, and Guttmacher and Douglas, the reports of these authors met with widespread skepticism. As pointed out by Schumann, it was feared that errors in presentation would follow its use, that an aggravation of the usual injuries to the birth canal would occur, that puerperal infection would often follow and that the fetal mortality would be increased due to prolapse of the cord and other accidents. For almost ten years now the method has been in extensive use with several thousand inductions on record; yet none of these things has happened. On the contrary, several authors state that their maternal morbidity and fetal mortality have actually been reduced following induction by this method; all agree that the average length of labor has been shortened by almost 50 per cent. These gratifying results carry far-reaching implications. They not only challenge our previous conception of "dry labor" but seem to indicate that the major rôle we have long assigned to the bag of waters in cervical dilatation is incorrect. From a practical point of view they have given rise to the impression that labor may be induced safely by this method in almost any type of case, regardless of indication or contraindication. These facts suggest that this widespread practice merits careful evaluation. When compared with other methods, what are its efficacy and safety?

CASTOR OIL, QUININE, AND PITUITRIN

The most widely used medicinal method of induction is *castor oil and quinine*. The rationale of the procedure is based on the belief that the castor oil produces a certain degree of pelvic engorgement which, either directly or through nervous plexuses, stimulates uterine contractions. When the pelvic congestion is at its height, that is, when evacuation occurs, an attempt is made to augment the effect by a hot enema and small doses of quinine. In general, this method has lost favor during recent years because (1) it is successful in less than 50 per cent of cases, even with patients at term and (2) quinine is suspected of exerting a harmful effect on the fetus in any but the smallest doses. Although Reis

in 1919 reported an efficacy of 75 per cent for castor oil and quinine, subsequent observers have been unable to approach this figure even in patients at or beyond term. In 199 attempts at induction with this method reported by Reddoch, there were 100 successes (50.2 per cent). This is approximately the figure obtained by McGoogan. In the reviewer's hands the success of the procedure has been under 35 per cent. There is considerable evidence which suggests that quinine in large doses exerts a harmful effect upon the child. The studies of Sadler, Dilling, and Gemmell show that quinine passes readily into the placenta and amniotic fluid; it has been found in fetal tissues in strengths which are capable of toxic effect and after intervals which suggest that maternal reabsorption from the fetus is slow and that its excretion into the fetal urine is limited. In common with other obstetricians these authors find that the presence of meconium in the amniotic fluid is more common after quinine. While it is impossible to prove statistically that quinine is an actual cause of stillbirth, many obstetricians feel that it is partially responsible for a few such deaths and for this reason the present tendency is to reduce the total dosage to 10 gr. (0.6 gm.) or less. In this connection it is helpful to know that Schübel, on the basis of animal experiments, considers small doses of this drug more efficient in producing uterine contractions than large ones. He points out that quinine is both a stimulant and a depressant of the sympathetic nervous system, depending on the method of administration and dosage; thus, weak solutions of quinine stimulate the isolated rabbit uterus, whereas strong concentrations paralyze it. For this reason alone, he urges that obstetricians use small amounts for the induction of labor and recommends 1 to 2 mg. of quinine hydrochloride intramuscularly for each kilogram of body weight in order to produce uterine contractions in from one to two hours. In a woman weighing 140 pounds this would mean an intramuscular dosage of only 1 to 2 gr. In Schübel's opinion such small quantities sensitize the uterus to mechanical and chemical stimuli for days, especially to posterior pituitary preparations. After minute doses of quinine small amounts of pituitary extract suffice to produce uterine contractions, but if large quantities of quinine are given, the uterus remains paralyzed for many days and does not respond to pituitary preparations. Finally, Schübel shows that in some obstetric clinics where small doses of quinine have been employed, as he has recommended, better results have been obtained than with the large amounts previously used.

Although induction of labor by castor oil and quinine frequently fails, the method possesses the advantage of being harmless, provided the dosage of quinine is limited to 10 gr. (0.6 gm.). Its use should be restricted to patients at or beyond term since it will rarely succeed before then.

When castor oil and quinine, or castor oil alone, are followed by pituitrin, the effectiveness of the procedure is considerably increased, the incidence of success ranging from 50 per cent (Stein and Dover) to 90 per cent (Watson). At the same time a certain degree of risk to the child is introduced since tetanic contraction of the uterus occasionally follows. Efforts have been made to circumvent this danger in two ways: by repeated small doses of pituitrin and by its intranasal application. Mathieu in 1927 recommended a technique which consisted in giving quinine and castor oil, and two hours later a hot enema,

followed by pituitary extract in 3 minim doses intramuscularly at half-hourly intervals for as many as fifteen doses if necessary. In order to take advantage of the oxytocic effect of the pelvic engorgement caused by the castor oil, the quinine and the hot enema, he followed the enema immediately with the first injection of pituitary extract. In 91 patients he had 71 per cent success. Watson's high incidence of success with the method (90 per cent) was achieved by employing much higher dosages of pituitrin than are ordinarily considered safe, namely, 0.5 c.c. injections until six, if necessary, have been given. Impressed by the danger from tetanic contraction of the uterus following pituitrin, Hofbauer in 1927 introduced the nasal administration of the hormone, his idea being that the pituitrin-soaked pledget of cotton could be withdrawn from the nose if uterine contractions became too strong. This method has now been in general use for some ten years and is to be recommended with the following reservations: (1) following the application of the pituitrin, the obstetrician must stay constantly at the bedside, observe the duration of each contraction and count the fetal heart beats thereafter; a contraction which lasts longer than two minutes or a fetal heart rate below 100 calls for withdrawal of the pituitrin-soaked pledget; (2) failure to induce contractions is sometimes observed as the result of faulty absorption, due apparently to some abnormality of the turbinate mucous membrane. Such a failure does not rule out idiosyncrasy (as some authors suggest), and if recourse must be had to intramuscular pituitrin, the usual caution must be exercised, that is, the maximal dose should be three minims. Pituitrin is contraindicated in the toxemias of pregnancy because of its pressor effect on blood pressure.

ARTIFICIAL RUPTURE OF THE MEMBRANES

It will be recalled that artificial rupture of the membranes, a favorite method of inducing labor in the late eighteenth century, was discarded early in the nineteenth century and for a hundred years or so was little used. The long aversion to the procedure hung on the conviction that the bag of waters played the principal rôle in cervical dilatation and was therefore indispensable to normal labor. This belief rested not only on theoretical considerations but on the observation that cases of spontaneous, premature rupture of the membranes were sometimes followed by prolonged labor and other complications. Emphasized in textbook after textbook, this conception of the bag of waters has long been regarded as an almost axiomatic truth. It has been part and parcel of all our obstetric teaching, and we find it difficult, as did obstetricians a hundred years ago, to view without prejudice the deliberate puncture of the membranes for the induction of labor or any other purpose. Consequently, if we are to make an unbiased appraisal of this procedure, it is necessary at the outset to inquire into the validity of this old doctrine.

If the bag of waters serves an important function in cervical dilatation, it is self-evident that its preservation should shorten labor whereas its rupture should prolong it. The results of recent studies on this subject, covering many thousand cases, have been clear-cut and decisive: premature rupture of the membranes, both in primigravidae and multi-gravidae, *shortens* the average duration of labor. This holds true whether the rupture has been spontaneous or artificial. For instance, Brodhead has reported 182 private cases, in 80 of which the membranes

ruptured before labor began (in one case a whole month elapsed), while in 102 the rupture occurred at the onset of or early in labor. In 16 patients with membranes ruptured for twenty-four hours or more before the onset of labor, the average duration of labor was some sixteen hours for the 8 primiparae and some seven hours for the 8 multiparae. In the whole group of 182 the average length of labor was thirteen hours forty-two minutes for the primiparae and seven hours forty-two minutes for the multiparae. Quigley, in a study of pregnancy and labor in elderly primiparae (thirty-five years or more), noted dry labor in 82 out of 237 cases. The average length of labor in these patients was 11.6 hours, while in the entire series it was 15.3 hours. One of the most comprehensive and detailed reports on this subject is that by Margaret Schulze on 604 cases of dry labor occurring in a series of 6,500 deliveries (9.3 per cent). She considered only those cases in which rupture of the membranes occurred prior to or at the onset of labor. The length of labor was shorter than the average for the patients with intact membranes, the first stage being chiefly affected. The average of the first stage was 12.1 hours for primiparae and 7.1 hours for multiparae, with second stages averaging 1.82 hours and 0.9 hour, respectively. In 8.4 per cent of the patients labor lasted over twenty-four hours, as contrasted with 12.4 per cent in 500 consecutive cases reported from the same clinic by Slemmons. The recent reports of Sunde and of Wichmann, covering large series of cases observed in Oslo and Helsingfors, show a similar shortening of labor after spontaneous, premature rupture of the membranes. Following artificial rupture of the membranes before the onset of labor, the results are even more striking. In one of the first studies of the procedure, Guttmacher and Douglas in 1931 reported 120 cases of induction by this method and found that labor was shorter than in normal cases by 73 per cent in primiparae and by 116 per cent in multiparae. In primiparae and multiparae alike, both stages were shortened and this could be ascribed only to the rupture of the membranes. Subsequent studies by Slemmons, Morton, A. G. King, Reddoch, Fitzgibbon, Stern, Mathieu and Holman, Plass and others show similar results and afford ample evidence that labor is shortened almost 50 per cent by artificial rupture of the membranes.

But it may be argued that such rapid cervical dilatation is pathologic and must be associated with considerable trauma to the cervix. This contention is refuted by the findings of several authors. For instance, Sehumann made careful examinations of the cervix during and after labor and found that patients whose membranes had been ruptured prematurely showed a slightly lower incidence of cervical laceration than those with intact membranes. Similarly, N. H. Williams, whose custom it is to repair the cervix on the ninth day, reports that intermediate repair is decreased some 50 per cent in patients with premature rupture of the membranes.

Premature rupture of the membranes, then, whether spontaneous or artificial, usually accelerates cervical dilatation and does so with no increase of cervical trauma. In view of this fact it would seem illogical to assign to the bag of waters any important rôle in cervical dilatation and little by little the old teaching on this subject is being abandoned. Thus, Slemmons believes that the classical explanation of cervical dilatation by the hydrostatic wedge of the bag of waters is incorrect. Deprived of the possible action of such a mechanism, 132 cases reported

by him suffered no handicap with regard to the first stage and terminated satisfactorily. Nor did the presenting part of the fetus act as a substitute, for this contingency was ruled out by careful, frequent rectal examinations. He found, moreover, that the phenomena associated with the transformation of the cervix following premature rupture of the membranes were the same as those accepted as normal. First, the canal became effaced with simultaneous obliteration of the internal os; and subsequently the external os became more and more widely dilated. Slemons believes that the mechanism of the first stage of labor from beginning to end may adequately be explained by retraction of the uterus, that is, by rearrangement of the muscle fibers in response to the forces which pull them upward toward the fundus. Similarly, Fitzgibbon of the Rotunda is convinced that "the bag of waters does not play any part in the dilatation of the cervix." Kreis is of the opinion that the bag of waters has little or no effect on the effacement of the cervix or on the dilatation of the external os, but considers these changes due to the action of the longitudinal fibers of the uterus on the fibers of the cervix which are pulled up into the lower segment. E. L. King and other authors agree with these views. In short, the belief is growing, on the basis of sound evidence, that the bag of waters serves no function in cervical dilatation and effacement. As we have indicated, an honest acceptance of this new viewpoint is prerequisite to any fair appraisal of the subject at hand.

Technique.—Rupture of the membranes is accomplished after placing the patient in the lithotomy position and carrying out full antiseptic toilet of the vulva as for delivery. The first two fingers of one hand are inserted into the cervix until the membranes are encountered. The cervix is gently stretched and the membranes stripped from the region of the internal os. A long hook, similar to one blade of a disarticulated vulsellum tenaculum, is inserted into the vagina and the membranes simply hooked and torn by the tip of the sharp instrument. As much fluid as possible is allowed to run away. Anesthesia is seldom necessary in multiparae, occasionally in primigravidae. In Reddoch's series of 146 cases, including 32 primigravidae, anesthesia was never found necessary. Plass employed some form of sedative (morphine or barbiturates) in about one-third of his 681 cases. It is general practice to precede the actual puncture of the membranes by castor oil and a hot enema; until recently quinine was also used routinely as a preliminary oxytocic, but the reports of Mathieu and Holman, of Reddoch, and others indicate that it does not increase the efficiency of the method. Mathieu and Holman found that their results were equally good when the castor oil, as well, was omitted, and they recommend a hot enema only as a preliminary procedure. If satisfactory pains have not ensued within four hours after rupture of the membranes, pituitrin is usually employed to accelerate the onset of labor. In Morton's practice, artificial rupture of the membranes is followed routinely at hourly intervals by nasal pituitrin until regular contractions have been established.

Contraindications.—Three conditions must be present before artificial rupture of the membranes is safe. (1) The lowermost part of the head must be at or below the level of the ischial spines. (2) The patient must be near or past her expected date of confinement. (3) The cervix must be soft and the canal less than 1 cm. long. Absence of any one of these

conditions constitutes a definite contraindication to the method. Probably the most important contraindication is an unengaged head because of the associated danger of prolapse of the umbilical cord. The very fact that the head is high in a primigravida, moreover, indicates that the patient has probably not yet approached the date when labor may be expected to start spontaneously. (About an 85 per cent probability, since in approximately this proportion of primigravidae the head is engaged during the last week of pregnancy.) This brings us to the second contraindication. The method should never be used if the patient is more than ten days from her expected date of confinement because experience shows that it is less successful at that time; indeed, all methods of induction become less efficacious as they are used further and further from term. The third important contraindication to the method is a long firm cervix. This not only renders the technical puncturing of the membranes difficult but presages a long latent period before labor ensues and, in addition, a prolonged first stage (Table I). Most authors agree that the method is also unsuitable in breech presentations.

The importance of these contraindications to artificial rupture of the membranes is rather generally recognized but recently Plass has induced labor by this method in 681 cases, disregarding entirely two of the contraindications we have mentioned. The presenting part was floating in 335 cases and was fixed but still above the spines in 300 others, leav-

TABLE I. SHOWING THE LATENT PERIOD AND DURATION OF LABOR AS GOVERNED BY THE CONDITION OF THE CERVIX IN 150 CASES OF ARTIFICIAL RUPTURE OF THE MEMBRANES. (MORTON, 1933)

CONDITION OF CERVIX	LATENT PERIOD		DURATION LABOR	
	MULTIP.	PRIMIP.	MULTIP.	PRIMIP.
Canal obliterated, os dilated 1, 2, 3 cm.	0.5 hr.	1.03	2.18	6.26
Cervix partially obliterated, just open	1.06 hr.	1.56	3.72	7.01
Cervix long, closed	5.0 hr.	2.69	4.82	15.85

ing only 46 patients with the head actually engaged. The cervix was completely effaced in only six instances but was thinned to some extent in 42 others, while it was thick and uneffaced in 633. The canal admitted one finger in 468 cases and two fingers in 181 cases, while in 32 instances it was closed, necessitating digital or instrumental dilatation before the amnion could be reached. All but 29 of the patients, however, were at or very near term. In general, the results were surprisingly good with no maternal mortality and an exceedingly low fetal mortality. "There were five prolapsed cords," Plass points out, "a higher incidence than should have been noted if spontaneous rupture of the membranes had been permitted; two of these babies were lost and their deaths may be attributed to the procedure. Prolapse of an arm occurred once and demanded later intervention to accomplish delivery." In a series of 303 cases at the Johns Hopkins Hospital, quite comparable in other respects to those of Plass, but in which the head was engaged, there was only one case of prolapsed cord. This represents an incidence of 0.3 per cent, whereas in Plass' series it was approximately 1 per cent. The importance of Plass' work lies in the demonstration that this method may be employed in exceptional cases, under urgent indication, even though the head is not engaged and the cervix

not effaced; the hazard to the child, however, is definitely increased, and as the author himself states, "it should generally be used only in cases where there is an indication for the interruption."

Latent Period.—It is well known that the period from the rupture of the membranes (whether spontaneous or artificial) to the onset of definite labor is directly related to the incidence of uterine infection. Following artificial rupture of the membranes for the induction of labor, this latent period averages about three hours in primigravidae and five hours in multiparae, as reported by various authors. These average figures, however, mean very little when we are attempting to look into the hazards of the method; we are rather interested in the frequency of very prolonged latent periods since these are likely to increase the incidence of infection. Plass found that the latent period was longer than twenty-four hours in 4.7 per cent of his cases with the longest interval eighty-eight hours (almost four days). In one case, where early delivery seemed imperative, a Voorhees' bag was introduced to stimulate painful contractions. In a series of 115 cases Higgins found that contractions began within six hours in 47 per cent, within twenty-four hours in 85 per cent, but "occasionally a patient will have no pains for two days or longer." Leo Wilson, among 25 inductions by artificial rupture of the membranes, encountered one latent period of fifty-seven hours and another of forty-two hours; in the latter case rather severe sepsis followed. Among Morton's 150 cases there were two failures and one led to grave difficulties. Reddoch met one latent period of fifty-three hours among 146 cases and states that several others lasted over twenty-four hours. The longest interval found by Jackson, however, in 500 cases was only thirty hours.

It is thus clear that in the vast majority of cases the latent period following artificial rupture of the membranes is not long enough to jeopardize the safety of the patient. As we have indicated, however, almost every series reported contains one or two cases in which this interval was greatly prolonged and in which serious potentialities resulted. These occasional troublesome cases, possibly one in fifty, have no appreciable effect on average statistics so long as the patient survives, but they must not be lost sight of. They constitute, perhaps, the chief reason for believing that artificial rupture of the membranes is not always a harmless procedure but one which imposes on the patient a slight but definite risk.

Morbidity and Mortality.—When compared with clinic statistics in general the figures for maternal morbidity and fetal mortality following artificial rupture of the membranes are low. Thus, Guttmacher and Douglas found that the morbidity in their 120 cases was about one-half that usual in the clinic; their fetal mortality rate was 5.88 per cent, only a trifle higher than the rate of 5.16 per cent for the total series of the hospital. Mathieu and Holman have compared the results obtained in 750 consecutive inductions of labor by this method with their results in 750 contemporary, consecutive cases in which labor had not been induced and from which cesarean section had been omitted. The maternal morbidity was almost identical in the two groups, namely, 7.07 and 6.6 per cent, respectively, as judged by the British standard. Their gross fetal mortality in the two groups was also very similar: 4.0 and 3.8 per cent, gross, 0.8 and 1.3 per cent corrected. Among Plass' 681

cases there were 11 stillbirths (1.62 per cent) and 10 neonatal deaths (1.47 per cent) with 9 of the fatalities occurring among 29 premature infants. The total fetal mortality among 652 infants weighing more than 2500 gm. was 1.8 per cent. His incidence of mild uterine infection, however, was slightly higher in this series than in his clinic as a whole.

Maternal deaths directly attributable to artificial rupture of the membranes appear to be exceedingly rare. Leo Wilson, however, reports one fatality in a patient with heart disease; after 500 c.c. of fluid had been released she became markedly cyanotic and died immediately afterward. Another patient with cardiac disease almost died after 700 c.c. of fluid escaped. The author warns against the use of the method in such patients.

In evaluating these statistics it must be recalled that they are based on carefully selected cases. With few exceptions the patients have been at or near term with the head engaged and the cervix favorable for labor. Cases of contracted pelvis and malposition have been excluded and to a considerable extent cases with the occiput posterior. In the main cases of breech presentation have also been omitted. How these figures would compare with those which might be obtained in an *equally favorable group* in which labor was allowed to start spontaneously, is not known.

INDUCTION BY BOUGIES

Except for Morton's study, published in 1930, the literature contains scant reference to the results which have been obtained by bougies in the induction of labor. In 160 cases of bougie induction, Morton found the procedure successful in 82.5 per cent of the cases; there were two maternal deaths in the series attributable to the bougies, one patient dying from uterine infection and the other from perforation of the uterus by the bougie. Among cases in which the infant was mature (2,500 gm. or more), the uncorrected fetal mortality was 9.3 per cent, the death of the child being due in six instances to prolapse of the umbilical cord. In Morton's series a single extremely large bougie (about 3 cm. in diameter) was inserted by means of a speculum, extra-ovularly, if possible.

Two small bougies (36 cm. in length, 1 cm. in diameter and fitted with wire stylet) offer certain advantages over a single large one, notably, greater ease of introduction, particularly when the cervix is closed, and less likelihood of rupturing the membranes and causing the cord to prolapse. In 50 cases of induction by means of a small bougie in the form of a catheter, Reddoch found that 18 per cent of the patients went into labor in less than two hours, 52 per cent within two to ten hours, while in 30 per cent the latent period exceeded ten hours. In one primigravida, in whom labor was induced by a catheter, labor did not ensue for three days. Two fetal deaths occurred in full-term infants and Reddoch believes these were directly attributable to the induction. He found, moreover, that intrauterine manipulation with bougie or catheter predisposed to a high maternal morbidity. Multiple small bougies have been particularly favored in England where Townend and others have reported successful results in large series of cases. When used before the last month of pregnancy, however, the results are less satisfactory since uterine inertia and infection are not infrequent sequelae. At the Middlesex Hospital, where labor was induced prematurely in 44 primi-

gravidæ, uterine inertia occurred in 38 per cent. The induction of labor by this method at the King's College Hospital increased the forceps rate no less than three fold, while 45 per cent of the patients showed definite evidence of uterine infection after delivery. Curling or kinking of the bougies in the lower uterine segment is not an uncommon accident when small flexible bougies are used; abnormal tetanic uterine contractions then follow without true labor pains. The position of the bougies should be checked by x-ray in questionable cases.

Bougie induction has a definite field of usefulness in cases in which artificial rupture of the membranes is contraindicated. When the cervix is long and the canal tightly closed, particularly in patients three or four weeks from term, bougie induction is preferable. It imposes a definite hazard on both mother and child, however, and should be used only on fairly urgent indication.

BAG INDUCTION

In a series of 49 bag inductions studied by Morton in 1929, he showed that the incidence of prolapse of the cord was four times greater with the bag than with the bougie, and that bag induction caused a considerably greater fetal mortality and maternal morbidity. Similar results have recently been reported by Zeisser who encountered four cases of prolapse of the cord in 35 inductions with 2 fetal deaths. There is general agreement today that induction of labor by means of the bag is the most dangerous of the several methods and has a limited field of usefulness. It is resorted to chiefly in two groups of cases: (1) Patients with premature rupture of the membranes in whom medicinal methods (nasal pituitrin, etc.) have failed to initiate labor; (2) cases of obstinate uterine inertia in which medicinal methods have failed to promote cervical dilatation.

SUMMARY

Castor Oil and Quinine.—Efficacious in 40 to 50 per cent of patients at term; harmless if dosage of quinine is 10 gr. or less.

Castor Oil, Quinine, and Pituitrin.—Efficacious in 60 or 70 per cent of patients at term; harmless if dosage of quinine is low and if administration of pituitrin (preferably nasal) is vigilantly supervised. Contraindicated in toxemias.

Artificial Rupture of Membranes.—Efficacious in 98 per cent of patients at term, provided contraindications are followed. Labor is usually shortened. In about 2 per cent of the patients the latent period is unusually long and in these cases the likelihood of infection is increased. The method is therefore not without some small danger and should be used only on definite indication, that is, when the hazard of allowing the pregnancy (presumably pathologic) to continue is greater than the slight hazard involved in the induction.

Bougie Induction.—Useful in cases in which artificial rupture of the membranes is contraindicated, particularly when patient is three or four weeks from her expected date of confinement. At that time efficacy is probably 70 or 80 per cent. Danger imposed on mother and child is greater than artificial rupture of membranes and should be used only on urgent indication.

Bag Induction.—Field of usefulness is limited to (1) occasional cases of premature rupture of membranes in which medicinal methods have failed to induce labor and (2) certain cases of uterine inertia.

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Béclère, C.: Undiagnosed Bilateral Hydrosalpinx, Bull. Soc. d'obst. et de gynec. 26: 381, 1937.

In 1927 Béclère first demonstrated the radiologic characteristics of clinically undiagnosed hydrosalpinx. He pointed out that this lesion is much more common than is generally believed. During the last ten years in a series of 800 hysterosalpingographies the author found more than 100 cases of undiagnosed hydrosalpinx. He has observed this condition in almost one-fourth of his sterility cases, in 15 per cent of his patients with chronic pelvic infections, in one-third of his patients with intermenstrual pain, in four-fifths of his patients with intermenstrual bleeding and in 4 per cent of women who have uterine hemorrhages of unknown origin.

Symptoms which should make one suspect hydrosalpinx are as follows: A flare-up of acute salpingitis after a mild gynecologic procedure, disappearance of masses after a flare-up, failure to relieve a chronic pelvic infection with diathermy, the presence of intermenstrual difficulties, intermittent hydrorrhea and a history of pelvic peritonitis or essential ascites.

Radiological signs consist of the following: (1) The presence of spherical drops, separated from one another. This proves that lipiodol fell into a liquid. This sign is present in most cases of latent hydrosalpinx. The drops usually appear as two symmetrical masses. If they appear as a single midline mass, this is an indication of fluid in the culdesac. (2) The tubal shadow is ordinarily diffuse and irregular. If, however, it is sharp and precise a hydrosalpinx should be suspected. The author points out that the rare cases of acute salpingitis which follow hysterosalpingography in cases of hydrosalpinx are due to overdistention of the tubal cavities with lipiodol. This occurs in 5 per cent of hydrosalpinx cases.

The treatment of bilateral latent hydrosalpinx is operation or nothing at all, because treatment often leads to an attack of acute salpingitis.

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Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D.

Selected Abstracts

Physiology of Labor

Föderl, V.: Investigation of the Average Duration of Labor in Primiparas, Secundiparas and Multiparas and Its Relation to the Age of the Woman in Labor, Monatschr. f. Geburtsh. u. Gynäk. 102: 65, 1936.

Föderl investigated the records of 10,000 women who had normal labors, normal pelvis and spontaneous deliveries of babies weighing between 2,500 and 3,500 gm. born in occiput anterior rotation. The average duration of the entire labor for primiparas was fourteen hours and five minutes of which twelve and one-half hours was for the first stage, one hour and nineteen minutes for the second stage, and thirteen minutes for the third stage. In secundiparas the average duration of labor was eight hours, eight minutes, divided as follows: first stage, seven hours fifteen minutes, second stage forty-one minutes, and third stage twelve minutes. For women having 3 or more children the average length of labor was eight hours forty-one minutes, of which seven hours forty-five minutes was for the first stage, forty-three minutes for the second stage, and thirteen minutes for the third stage.

As the criterion for the onset of the first stage the author considered the onset of regular, painful uterine contractions, and as the indication for the beginning of the second stage of labor he took bearing down efforts.

Among primiparas the longest duration of labor was in the women between thirty and thirty-five years of age for in them labor lasted nineteen hours and six minutes. On the other hand, labor among women between forty and forty-five years of age was almost identical with that of women between twenty and twenty-five years old. Nevertheless, whereas in women between twenty and twenty-five years only 8 per cent required operative interference almost 70 per cent of those between forty and forty-five required assistance in labor. Hence only 30 per cent of elderly primiparas have easy labor. The explanation for this phenomenon has been offered by L. Meyer who pointed out 2 classes of elderly primiparas. The first consists of those who could not become pregnant until after many years of married life because of hypoplasia due to a primary endocrine defect. These women have difficult labors. The second group consists of elderly women who did not conceive earlier for economic, social or other reasons. These women give birth to children as easily as young individuals.

J. P. GREENHILL.

Marcus, H.: Fixation of the Fetal Head During Pregnancy, Acta obst. et gynec. Scandinav. 16: 356, 1936.

The classical rule that the fetal head during the latter part of pregnancy is fixed in the pelvis in a primipara, whereas in a multipara it remains movable up to delivery, is generally emphasized in the textbooks.

In recent years, however, several authors have been able to demonstrate the comparative unreliability of this rule. However, too few or too incomplete observations are offered for a closer study of the condition relating to the fixation of the fetal head.

The present investigation is based on a clinical material of normal delivery cases, embracing 1,863 observations in 184 primiparas and 3,559 observations in 301 multiparas, all of whom were checked practically every day by a smaller or greater number of observations regarding the position of the fetus. Besides external, a rectal examination as a rule was also carried out.

The result of the investigation may be summed up as follows:

At examinations of normal gravidas, a movable fetal head is far more frequently found than a fixed head during the last weeks of pregnancy. This preponderance of movable heads, present in about three-fourths of the observations, is slightly smaller in primiparas than in multiparas. Even in multiparas a fixed fetal head is found during the above-mentioned period in a considerable number of examinations (about 20 per cent). In primiparas, somewhat more frequently than in multiparas, the fetal head remains constantly fixed up to the delivery.

In no less than one-third of the cases and with equal frequency in primiparas and in multiparas, alternations between fixation and movability take place as late as the last days before delivery.

Such fluctuations have been observed relatively frequently (in 45 cases) even after verification of the fixation by rectal examination. At the beginning of labor, the head (before the rupture of the membranes) is more frequently fixed in the primiparas (in two-thirds of the cases) than in the multiparas (in one-half of the cases). Approximately the same proportion is found in cases which were examined only after rupture of the membranes.

J. P. GREENHILL.

Guthmann, H., and Bienhüls, M.: The Onset of Labor Pains, the Duration of Labor and the Time of Day, Monatschr. f. Geburtsh. u. Gynäk. 103: 337, 1936.

The authors analyzed a series of 26,707 labors and found that deliveries during the day and night were equally divided. To their own series of cases they added those of three other authors and in a total of 121,794 cases they found the incidence of day-time deliveries to be 49.1 per cent and night-time births to be 50.9 per cent. Among primiparas 48.8 per cent of the births took place at night whereas 51.2 per cent of the multiparous births took place at this time. The greatest number of births occurred at 11:00 A.M. Labor began during the night among 60.5 per cent of primiparas and among 56.9 per cent of multiparas. Since 1923 there has been a gradual decrease in the number of night-time deliveries.

J. P. GREENHILL.

Moir, Chassar: Expulsive Force of the Uterus During Labour, Lancet 1: 414, 1936.

The author corroborates the findings of Bourne and Burn on uterine forces. In the first stage the pressure varied from 35 to 60 mm. of mercury with 45 mm. as an average. There is not much change in the magnitude of contractions during the second stage. If pituitrin is injected the tension may be increased by 90 mm. of mercury. The secondary expulsive power is important because there may be an increase of 40 or 50 mm. Even before the onset of labor, the force of the painless contractions may almost equal those during labor.

These measurements were taken by use of an intrauterine bag.

With an intrauterine tension of 15 mm. of mercury and an average increase of 45 mm. in the first and second stage is produced an average of 60 mm. pressure.

With these pressures and an additional 45 mm. from secondary expulsive forces, a total average of 105 mm. of mercury pressure is transmitted to the fetus during parturition.

H. CLOSE HESSELTINE.

Léon, J., and Ferrari, R. A.: Our Abdominal Belt for the Second Stage of Labor, Bull. Soc. d'obst. et de gynéc. 25: 417, 1936.

The authors are of the opinion that their abdominal belt decreases the duration of labor not only among multiparas but among primiparas as well. It does this without increase in the frequency of perineal lacerations. The use of this belt reduces the necessity for the use of pituitrin during the second stage of labor. It also reduces the frequency of Kristeller expression and the use of forceps. In the extraction of babies by the breech the belt prevents deflection of the head and dislocation of the arms. After symphysiotomy the belt permits spontaneous delivery without the use of oxytocics.

J. P. GREENHILL.

Ehrhardt, K., and Henss, E.: The Artificial Induction of Labor in Postmature Pregnancy, Med. Klin. 32: 1700, 1936.

The authors used castor oil, quinine, and pituitary extract to induce labor in 322 cases of overterm pregnancy and were successful in 80 per cent. Multiparas reacted more favorably than primiparas. In the primiparas where labor was successfully induced, the duration of the labor was shorter than normal. The best results were obtained in women who had gone one or two weeks past term. There was no apparent increase of forceps deliveries or uterine atony after artificial induction of labor. The authors point out that by these means it is easy to bring about expulsion of a dead baby or a hydatidiform mole.

J. P. GREENHILL.

Reiles, M.: Artificial Induction of Labor, Rev. franç. de gynéc. et d'obst. 31: 335, 1936.

The author employed the Stein method in 86 cases. The chief indication was premature rupture of the membranes which occurred in 77 cases. The method proved successful in 71 cases or 82.5 per cent. In four of these cases two and in 3 cases three attempts were made before success was accomplished. In 62 of the 71 successful cases, delivery was spontaneous. The average duration of labor after induction was eight hours and forty-eight minutes for primiparas and four hours for multiparas. No child was lost because of the induction of labor. The total morbidity for the series was 18.6 per cent.

J. P. GREENHILL.

Movers, F.: Medical Induction of Labor, Monatschr. f. Geburtsh. u. Gynäk. 104: 184, 1937.

Labor was induced medically in 213 women who were at or beyond term. In 40.7 per cent of the cases labor was terminated within twenty-four hours. However, if the cases of repeated induction are excluded, the incidence of success was only 35.1 per cent. The combination of quinine with pituitary extract was more successful than quinine, calcium, and pituitary extract. However, quinine and calcium gave better results than quinine alone. Among the successful cases, labor was terminated by operative means in 19.6 per cent. The author's method of inducing labor is a modification of Stein's procedure.

J. P. GREENHILL.

- v. Numers, C.: **A New Method of Diagnosing Rupture of the Membranes**, *Acta Obst. et gynec. Scandinav.* 16: 249, 1936.

For the purpose of diagnosing rupture of the membranes in the course of labor, the writer attempted, by means of Sudan staining, to prove the occurrence in the vaginal secretion of free drops of fat or expelled cells of the fetal sebaceous glands derived from vernix caseosa. Through a glass speculum one drop of secretion is taken with a platinum loop and spread out on a carefully defatted slide. The preparation is air-dried and stained at room temperature in a dye solution, 0.2 to 0.3 gm. Sudan III in 100 c.c. of 70 per cent hot alcohol. The slide is washed in water, dried and examined immediately under low magnifying power. The fat substances are stained a distinct orange red; particles of mucus are sometimes stained weakly yellowish red. Of 141 samples taken before rupture of the membranes only 4 gave a slight positive Sudan reaction, the rest yielding a negative result (97.2 per cent). Of the 139 samples taken after rupture only one gave a negative reaction. Slight Sudan reactions seem to be relatively more frequent in premature cases. The faulty reactions amount to about 2 per cent of the entire material.

J. P. GREENHILL.

- Endres, P.: **Does Premature or Early Rupture of the Membranes Influence the Length of Labor**, *Monatschr. f. Geburtsh. u. Gynäk.* 105: 216, 1937.

Contrary to the general belief, Endres found that premature rupture of the membranes before the onset of labor shortened labor. This was true even when pregnancy was terminated prematurely or postmaturely. The shortening of labor takes place during the first stage. Hence the absence of the bag of waters not only does not influence the period of dilatation unfavorably, but it actually helps dilatation in many cases. The reason for this, in the opinion of the author, is the absence of resistance which is present when hydrostatic pressure is exerted by an intact bag of waters.

On the other hand, rupture of the membranes after the onset of labor pains but before complete dilatation of the cervix, prolonged labor. In these cases the increase in labor is due to a prolonged first stage. The cause for this is a temporary atony of the uterus which follows rupture of the membranes.

The practical significance of these findings is that premature rupture of the membranes is a justifiable procedure in certain cases. Above all, when premature rupture occurs spontaneously, drugs should not be given to hasten labor pains because they may have a detrimental effect.

J. P. GREENHILL.

- Reiles: **Induction of Labor in Cases of Premature Rupture of the Membranes**, *Bull. Soc. d'obst. et de gynec.* 25: 337, 1936.

Reiles employs the Stein method of inducing labor. In a series of 76 cases labor was successfully induced in 64, i.e., in 84.2 per cent. In all the cases where labor was not induced the cervix was long and uneffaced. The average duration of labor in the successful cases with spontaneous deliveries was eight hours and forty-eight minutes for the primiparas and four hours for the multiparas. No harm to the baby was observed.

J. P. GREENHILL.

- Sunde, A.: **Spontaneous and Artificial Rupture of the Membranes During Labor**, *Acta obst. et gynec. Scandinav.* 17: 133, 1937.

In 9,375 full-term labor cases observed at the Oslo Woman's Clinic, the time of rupture of the bag of waters was known. The author found that rupture of

the membranes before the onset of labor occurred in 13 per cent of the cases. It was more frequent in primiparas than in multiparas, and in older women. The risk of infection was greater after primary rupture than in the cases where the membranes ruptured after labor pains had started. The earlier the rupture the greater was the risk of infection.

J. P. GREENHILL.

Wichmann, S. E.: Rupture of the Membranes During Labor, Acta obst. et gynec. Scandinav. 17: 158, 1937.

Wichmann studied large series of primiparas and secundiparas and found that premature escape of fluid occurred with equal frequency in primiparas and multiparas and in about 10 or 12 per cent of women between twenty and twenty-four years of age. The tendency increased somewhat with age. The shortened period of labor usually observed in these cases is due to the nonpainful contractions which had occurred during the latent period. There was no increase in operative delivery, morbidity, mortality or prolapse of the cord in the cases of premature rupture of the membranes. Labor seems to be shortened by artificial rupture of the membranes but routine rupture of the bag of waters to hasten labor should be condemned.

J. P. GREENHILL.

Essen-Möller, E.: Has Premature Rupture of the Membranes Any Influence on the Progress of Labor, Acta obst. et gynec. Scandinav. 16: 1, 1936.

The author studied 1,000 cases of premature rupture of the membranes, and also 300 cases in which the membranes were ruptured artificially. He found that premature rupture of the membranes occurred much more frequently in multiparas than in primiparas. In the cases where the membranes ruptured prematurely, labor both in the primiparas and in multiparas was shorter than in women with intact membranes. Infection did not occur more often in premature rupture than in ordinary labor. Where infection did arise it occurred much more frequently after operative interference than after spontaneous labor. Operations were performed much more frequently after premature rupture of the membranes than otherwise. However, this did not result in an increase of either maternal or fetal mortality. Prolapse of the cord did not occur more frequently after premature rupture of the membranes.

When artificial rupture of the membranes was performed, more infections resulted than after spontaneous rupture of the membranes. Likewise operative interference had to be resorted to more frequently. Both the maternal and fetal mortality were higher after artificial rupture of the membranes than after ordinary labors or after spontaneous rupture of the membranes. The author concludes that the old apprehension concerning the danger of premature rupture of the membranes is not founded on facts. However, when the membranes are ruptured artificially, serious complications may result for both mother and child occasionally. Hence, the author warns that the membranes should not be ruptured artificially except for definite indications. He condemns the routine rupture of the membranes simply to hasten or shorten labor.

J. P. GREENHILL.

Günther, W.: Procteurysis (Rectal Tokokinesis) and Its Value as an Aid to Medical Oxytocics, Monatschr. f. Geburtsh. u. Gynäk. 106: 138, 1937.

Procteurysis was employed in a series of 360 cases where the membranes had ruptured. Günther found that the best results were obtained when this procedure was combined with the use of quinine. He also found that procteurysis was no better

than ordinary medical induction of labor. The author advises the use of a rectal bag only as an aid in the induction of labor at term in cases of premature rupture of the membranes.

J. P. GREENHILL.

Purandare, N. A.: Anterior Shoulder as a Guide to the Engagement of the Head and the Progress of Labour, J. Indian M. A. 5: 457, 1936.

The author points out that the greater the skill of abdominal examinations for recognizing different positions of the fetus in utero, the fewer vaginal examinations there need be with their attendant risk of introducing infection.

The anterior shoulder serves as a valuable guide to the progress of labor. It is easily palpable; it can be readily marked on the abdominal wall; its descent can be followed, and as it approaches the midline and crosses it and goes over to the other side, it indicates, especially in occipitoposterior positions that internal rotation of the head is taking place. The height of the anterior shoulder from the top of the symphysis pubis can be measured and from it the relation of the head to the pelvis judged. These heights are especially useful in cases being given a test of labor. When the head is above the pelvic brim the shoulder is $4\frac{1}{2}$ to 5 inches above the symphysis; when in the brim 4 inches; in the mid-cavity 3 inches; when at the outlet 2 inches; when at the pelvic floor $1\frac{1}{2}$ inches. These estimates were obtained from several hundred cases.

In occipitoposterior positions the anterior shoulder gives valuable information during labor. When the shoulder approaches the midline, it is a favorable indication of a spontaneous outcome of labor. When, however, even after rupture of the membranes the shoulder remains in the pararectal line, it indicates that internal rotation of the head has not begun.

F. L. ADAIR AND S. A. PEARL.

Levy-Solal, E., and Sureau, M.: Concerning the Period Known as "Physiologic Rest" During Normal Delivery, Bull. Soc. d'obst. et de gynec. 25: 221, 1936.

The authors believe that the so-called "physiologic rest" of labor pains after delivery is purely a theoretic conception. After the expulsion of the fetus there is usually a period during which the uterus is retracted and does not evidence any contractions. However, the studies of the authors have shown that the uterine contractions commence within a few minutes after the expulsion of the baby. These contractions increase in duration and intensity and produce the pain which the patient feels during the early puerperium. The cessation of contractions immediately after delivery constitutes an anomaly which prevents separation of the placenta. Hence, in the opinion of the authors, actual rest of the uterine muscle after the baby is born is not a physiologic but a pathologic condition. Anesthetics usually increase this period of rest and occasionally produce bleeding from the uterus. On the contrary, oxytocics increase the uterine contractions and hasten separation of the placenta.

J. P. GREENHILL.

Miller, Douglas: Common Obstetrical Injuries and Their Sequelae, Brit. M. J. 2: 4, 1936.

The author discusses injury to the pelvic floor, to the anterior vaginal wall by overstretching, to the lateral cervical ligaments caused by the application of forceps before the cervix is fully dilated; laceration of the cervix, especially in

primiparas; injury to the rectal fascia with its subsequent herniation and production of a rectocele; complete perineal tears, most often incurred in delivery of a breech in a primipara, or in the delivery of a face presentation. The avoidance of difficult labor by antenatal recognition of disproportion; careful determination of the position of the head before forceps are applied; conservatism in the use of forceps unless and until the head is low in the pelvis, and the avoidance of unnecessary overstretching of the vaginal walls and subjacent tissues by unduly withholding assistance; the evacuation of the bladder at regular intervals during labor and especially before forceps are applied; these are elementary obstetric principles, the observance of which may prevent much of the invalidism that follows childbirth.

The simple operation of episiotomy is a special prophylactic procedure and highly recommended. The care and skill with which injuries are repaired bears directly upon the prevention of subsequent disability. The practice of discharging patients on the eighth or ninth day after confinement is greatly to be deplored. Rest, massage and exercise are useful to restore tone in overstretched muscles. A well-fitting corset and a pessary may be valuable adjuncts postpartum. The smallest size pessary that is effective should be used so as to interfere as little as possible with involution of the vagina, and it should be replaced at frequent intervals by smaller sizes until involution is complete.

The development of genital prolapse is by no means always preventable, however.

F. L. ADAIR AND S. A. PEARL.

Barr, Adam, and Tindal, Andrew: A New Machine for the Self-Administration of Gas-and-Oxygen Analgesia in Labour, Lancet 1: 1271, 1937.

An apparatus for administering nitrous oxide and oxygen gas has been developed, intended for self-use by the patient in the late first and second stage. It is claimed to be safe, to deliver only a fixed proportion of gases, and to be economical, easily portable, and easily manipulated, yet efficient.

One hundred consecutive cases treated with this apparatus are reported, and in only 8 did it prove unsatisfactory. Chloroform was used in 6 patients who had forceps deliveries. There were no stillbirths or neonatal deaths. Cyanosis was not observed.

H. CLOSE HESSELTINE.

Banssillion, E., and Bucher, P.: Local Anesthesia of the Perineum During Obstetrical Interventions, Rev. franç. d. gynéc. et d'obst. 31: 858, 1936.

The authors make a plea for the more extended use of local infiltration of the perineum during labor either alone or combined with a general anesthetic. This procedure may avoid the necessity for an episiotomy. The authors report a series of 13 cases in which they employed infiltration anesthesia successfully.

J. P. GREENHILL.

Petersen, E.: Obstetrical Sodium Evipan Anesthesia, Acta obst et gynec. Scandinav. 16: 261, 1936.

Petersen analyzed the results obtained in 100 women who had been given sodium evipal as an anesthetic. In all the cases a satisfactory anesthesia was obtained. The author believes this form of anesthesia is superior to chloroform. No harmful effects were observed on mother or fetus.

J. P. GREENHILL.

Peck, H. A.: Analgesia in Labor, N. Y. State J. M. 36: 705, 1936.

Peck records his experience with the Gwathmey method in a consecutive series of 400 personally conducted cases.

The degree of the patient's discomfort rather than the degree of dilatation is preferred as an index of the analgesia necessary. The advantages of the method are: safety, availability for home or hospital use, practical lack of contraindications, economy, and ease of application. The comparative rarity of maternal and fetal complications is stressed. Low forceps and episiotomies of election were done in a considerable percentage of cases as a conservative measure.

There were no fetal deaths attributable to the method.

J. P. GREENHILL.

Prys-Jones, T. B.: Painless Labour, Brit. M. J. 2: 627, 1936.

At a time when the dangers and perils of childbirth are being somewhat widely and unduly aired in the popular press, the author finds it opportune to report a case of completely painless labor in an eighteen-year-old primipara, a domestic servant. The child was born within a period of ten minutes with a complete absence of labor pains, while the mother was at stool. The mother showed no evidence of fatigue or shock. The blood loss was normal, although the placenta remained in the vagina some two hours. The infant, 7 pounds, survived despite its rescue from a primitive earth closet.

F. L. ADAIR AND S. A. PEARL.

Items

NATIONAL COMMITTEE ON MATERNAL HEALTH

AN IMPORTANT NEW PROGRAM FOR RESEARCH

THE National Committee on Maternal Health, with headquarters in New York City, is engaged in formulating and effecting a program for the study of medical and social factors of human reproduction.

The necessity for a reconsideration of the former aims and work of the Committee was recognized last fall. It had gradually become clear that the publication program had been practically completed. In other words, most of the available knowledge in the Committee's field of activity had been compiled and given to the interested public in the form of books on various aspects of the field of maternal health. Various specific research projects were already under way. Future progress appeared to lie, then, in investigation rather than in compilation, since for the moment endeavors in the latter direction seemed to have reached a natural conclusion.

The field for further research in subjects occupying the borderland between the medical sciences on one side and the social sciences on the other, remained wide open for further study. No other organization has entered this region intensively. The biologist has advanced far into the field of infrahuman sexual physiology, but he has stopped short at the boundary of human problems. The physician has limited himself to

the more or less traditional concept and treatment of disease, including infection, trauma, new growths, and definitely abnormal psychologic conditions; but through the natural limitations of his time and technique, he has given up the trail when it appeared to lead him into unfamiliar sociologic or biologic fields. The sociologist, who until the present time has rarely shown much clinical instinct, has terminated his studies where the problem approached the field of medicine. Furthermore, most previous studies of sex biology have applied to a single sex. Yet the major portion of the population are aware of sex response or traumata in relation to the other sex. It seems important, then, in these border-line fields to study phenomena of sex biology in relation to the partner, particularly in the married couple. Accordingly, there appears to be a large area for study lying between medical and biologic fields on the one hand and social fields on the other, for which no research group is at present taking particular responsibility. This accounts for the new program of the National Committee on Maternal Health.

The Committee desires to establish itself as an impartial student of the medical, social, and psychologic factors of human reproduction. It has recognized the possibility of being influenced by either one of two types of thought: the sentimentality which in America attaches to a liberal or a radical point of view; or the determined conservatism which is active and effective in this field, especially as exemplified by organized medical bodies.

It is the strong feeling within the Committee that its work should be an unbiased and objective examination of the facts with commitment to no interested parties. This orientation is in accord with the new criticism with which many of the aspects of sex study and reform are being considered. Such a policy may involve the re-examination of many of our previously accepted tenets, but it is only by such a policy that the National Committee on Maternal Health believes it can exercise the influence that will give its work importance.

The Committee would endeavor to act in two capacities:

1. As a council to coordinate and advise research in its special field.
2. As an organization for actual research in problems of human reproduction, essentially those dealing with aspects of conception, by members or under the direction of members of the Committee. To this extent the Board of Directors has been enlarged to include representatives of pertinent disciplines and techniques: gynecology, obstetrics, urology, psychiatry, biology, and experts in the study of the family.

In both of these capacities the study of problems outlined in a carefully worked out plan is to be stressed, in which the techniques of the specialties just enumerated will focus on the problems under attack. This program includes five main heads:

1. *Sterility*, with special emphasis on psychologic and eugenic aspects, as well as on attempts toward therapy. The former are not covered by the conventional routine clinical study, and constitute problems of steadily increasing importance.
2. *Contraception*, including especially (a) a testing of methods; (b) a consideration of the physical, mental, and social effects within the family situation; and (c) possibly an attempt to work out a regulation of contraceptive practice in the face of our falling birth rate and in the interests of good public health and social well-being.

3. *Abortion*, in particular certain aspects of its prevention; the social causes back of induced abortion, with especial attention to recidivism; the subsequent fertility of frequently aborted women; and the impact of abortion on the family. Abortion is an almost untouched problem in the social field, and yet it is responsible for an important part of America's notoriously high maternal mortality rate.

4. *Sterilization*, in particular the development of a practical standardization of medical and eugenic indications for the use of the general physician or surgeon.

5. *Marriage consultation*, to be studied in a medically controlled center set up so that a better understanding of the problems of married life can be obtained, and the efficacy of certain forms of advice or therapy can be scientifically measured, as in other medical studies.

The New York charter of the National Committee on Maternal Health is elastic enough to make proper any of the studies envisaged in the new program. However, certain modifications of organization and operation may be made in order to render the Committee's work effective.

HOWARD C. TAYLOR, JR., *Secretary.*

The American Congress on Obstetrics and Gynecology

Preparations for holding The American Congress on Obstetrics and Gynecology are proceeding, several meetings having been held by the members and directors of The American Committee on Maternal Welfare, Inc., to develop the arrangements for convening the Congress in Cleveland during the week of September 11, 1939. Cleveland was selected as offering an easily reached central point with adequate hotel facilities and suitable meeting and exhibition space in the Convention Hall.

The Congress has been organized to include the interests of various groups of participants, such as medical educators, physicians, nurses, public health workers, hospital administrators, and others interested in the problems of human reproduction. The morning sessions are allotted for the presentation of scientific and technical papers in each group; in the afternoons mixed groups will participate in general discussions, and the evening sessions will be for the public, probably with broadcasts.

In addition there will be commercial and scientific exhibits developed to illustrate the work of various public and private agencies, and of individuals engaged in scientific activities pertaining to human reproduction. Those exhibits of a commercial character, as of instruments, books, apparatus, medicinal preparations, etc., will be of a high character and ethical in presentation.

An executive office devoted to the management of the Congress has been opened at The Annex of The American College of Surgeons, 650 Rush Street, Chicago, in charge of the General Chairman, where all inquiries may be addressed.

The directors of The American Committee of Maternal Welfare, Inc., are the governing body for the Congress, and are as follows: the Drs. George W. Kosmak, LeRoy A. Calkins, Robert L. DeNormandie, Robert

D. Mussey, Everett D. Plass, and Philip F. Williams. The general chairman is Dr. Fred L. Adair. Dr. Rudolph W. Holmes is Treasurer of the Congress and Dr. James R. McCord is Secretary. The organization of the committees is not yet completed but the following chairmen have been selected: Budget and Finance, Dr. Walter T. Dannreuther; Program, Dr. Frederick H. Falls; Arrangements, Dr. Joseph L. Baer; Membership, Dr. Philip F. Williams; with Dr. Buford G. Hamilton as Secretary.

The other committee chairmen and the personnel of the committees' subcommittees representing various interested groups, will be selected as rapidly as possible.

The executive secretary has not as yet been appointed. The officers of the Congress are desirous of enlisting the cooperation of all interested groups and individuals, and are glad to receive inquiries and suggestions from various sources.

The work of the Congress is being handled by several committees, and further announcements of these will appear in subsequent issues of medical, nursing, and other journals.

American Board of Obstetrics and Gynecology

The oral, clinical, and pathological examinations for Group A and Group B applicants will be held in San Francisco, California, on Monday and Tuesday, June 13 and 14, 1938.

An informal dinner for the Diplomates of this Board, their wives and others interested in the work of the Board, will be held at the Palace Hotel, San Francisco, on Wednesday evening, June 15, 1938, at seven o'clock. Dr. William D. Cutter, Secretary of the Council on Medical Education and Hospitals of the American Medical Association, will address the group, and the successful candidates of the preceding two days' examinations will be introduced in person. Tickets, at \$2.25 each, may be obtained in advance from Dr. Joseph L. Baer, 104 S. Michigan Avenue, Chicago, Illinois, or at the door. Reservations should be made in advance if possible.

Application for admission to the June, 1938, Group A examinations must be on file in the Secretary's office before April 1, 1938.

Application blanks and booklets of information may be obtained from Dr. Paul Titus, Secretary, 1015 Highland Building, Pittsburgh (6), Pennsylvania.

British Congress of Obstetrics and Gynaecology

The Eleventh British Congress of Obstetrics and Gynaecology will be held in Edinburgh on April 4, 5, and 6, 1939, under the presidency of Prof. R. W. Johnstone, C.B.E. For further information, please communicate with the senior local secretary, Dr. E. Chalmers Fahmy, 7 Chester Street, Edinburgh, 3.

Second All India Obstetric and Gynaecologic Congress

The Congress will be held at Bombay from April 13 to 16, 1938. A medical exhibition is also arranged as part of the program. Subjects selected for official discussions are: Toxemia of Pregnancy and Carcinoma of Cervix.

The Congress will be inaugurated by the Prime Minister, the Government of Bombay and the medical exhibition will be declared open by the Minister of Health. Dr. B. D. Mukherji of the Carmichael College, Calcutta, has consented to preside. All obstetricians and gynecologists are requested to attend the Congress.

Further information can be obtained from the organizing secretary, Raj Bhuvan, Sandhurst Road, Bombay 4.

Books Received

MANUAL OF OBSTETRICS. By Thomas Watts Eden, Past President of Royal Society of Medicine, etc., and Eardley Holland, Obstetric and Gynaecological Surgeon, and Lecturer on Obstetrics and Gynaecology, London Hospital, etc. Eighth edition, 765 pages, with 12 plates and 398 illustrations in the text. J. & A. Churchill, Ltd. London, 1937.

SYNOPSIS OF OBSTETRICS AND GYNAECOLOGY. By Aleck W. Bourne, Consulting Obstetric Surgeon, Queen Charlotte's Hospital, London, etc. Seventh edition, fully revised, with numerous diagrams, 452 pages. William Wood and Company, Baltimore, 1937.

VITAMINHAUSHALT IN DER SCHWANGERSCHAFT. Mit besonderer Berücksichtigung der Vitamine A und C. Von Dr. med. Gerhard Gaetgens, Universitätsfrauenklinik zu Leipzig. Mit 21 Abbildungen, 161 Seiten. Verlag von Theodor Steinkopff, Dresden, 1937.

WUNDVERSORGUNG UND WUNDBEHANDLUNG. Von Professor Dr. H. v. Seemen, chirurgische Universitäts—Klinik Muenchen. 66 Seiten. Verlag von Ferdinand Enke, Stuttgart, 1938.